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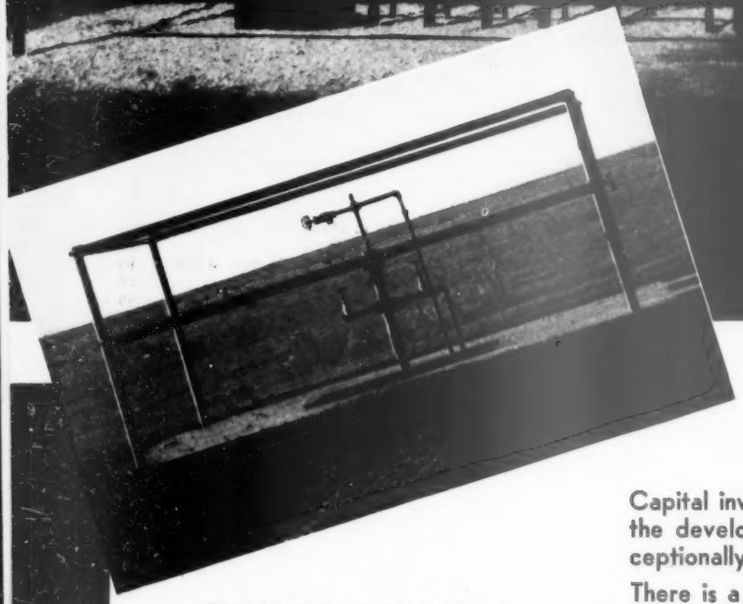

The Kobe Multiple Pumping Installation shown is in New Mexico where five wells over 4700 feet deep on 40-acre spacing are being handled from one plant. Three additional wells on the lease are to be connected later. Simple individual well connections are shown in insert picture. Pertinent operating facts as to production, strokes per minute, bottom hole pressures, etc., for each well are obtained from the individual well gauges shown at central plant.

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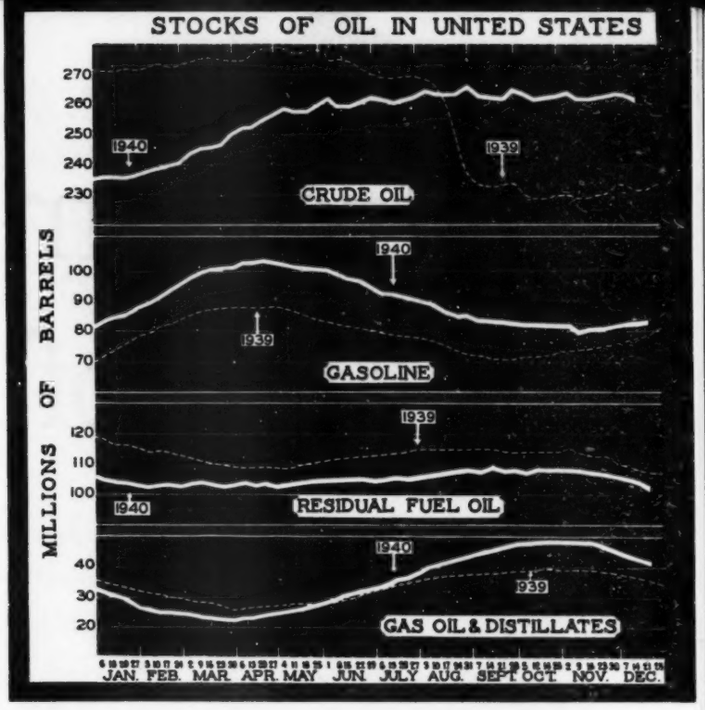
— HYDRAULIC PUMPING —

SYSTEM

Trends

Record Demand Year To Be Followed With More Gains in 1941



NEXT Tuesday will bring to a close a year which was unusual in many respects. It will start another year with conditions, in the opinion of many observers, on a more favorable basis than they were a year ago. In regard to consumption of all oils, domestic demands and total demands (domestic plus exports) for the year now closing, exceeded those of 1939 and in most cases new yearly records for finished products were established. The domestic gain in gasoline was one of the largest in the history of the petroleum industry.

CRUDE PRODUCTION *3,603,165 bbl. daily average—up 28,405 bbl. One year ago 3,866,550 bbl.*

CRUDE STOCKS *261,293,000 bbl. as of December 14—down 359,000 bbl.* One year ago 232,615,000 bbl.*

GASOLINE STOCKS *81,870,000 bbl. as of December 21—up 636,000 bbl. One year ago 80,905,000 bbl.*

RESIDUAL FUEL-OIL STOCKS *102,841,000 bbl. as of December 21—down 1,264,000 bbl. One year ago 107,149,000 bbl.*

GAS OIL AND DISTILLATES *42,260,000 bbl. as of December 21—down 1,674,000 bbl. One year ago 35,063,000 bbl.*

REFINERY RUNS *3,585,000 bbl. daily week ended December 21 — up 90,000 bbl. One year ago 3,395,000 bbl.*

*December 7 stocks corrected to 261,652,000 bbl.

War developments were largely responsible for a decrease of approximately 30 per cent in exports and an increase of 35 per cent in imports. Tanker rates moved up and down, closing at the highest levels in the recent history of the oil industry. Despite the large increase in imports and the substantial decline in exports, producers and refiners in this country had their best year in regard to volume. The large decline in exports starting at the close of the first quarter, and excessive production and refinery operations brought unwanted price changes. The trend was downward in gasoline throughout the year and at the close, net prices in most refinery, wholesale and retail markets were the lowest since gasoline became the principal product of the petroleum industry. Natural-gasoline prices were the lowest in the history of that branch of the industry. While prices for products other than gasoline were more favorable, quotations were under the 5-year averages in most cases.

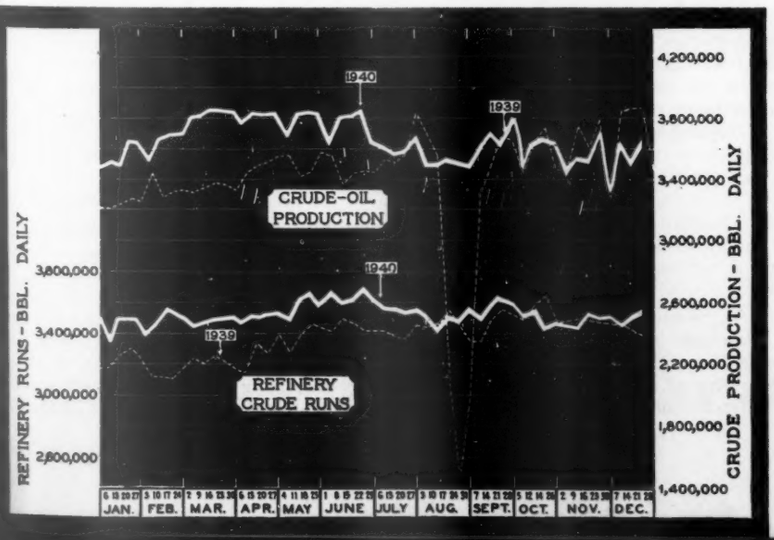
The industry will start another year with several conditions which need immediate correction. Those of an optimistic turn point out that no large field developments confront the industry at this time as was the case a year ago with the unregulated Illinois production on the way up.

DAILY AVERAGE PRODUCTION FOR WEEK

	Dec. 21, 1940	Bur. Mines Dec. est. of demand	December state allowables	Dec. 14, 1940
Arkansas	68,705	66,410	70,176	68,715
California	620,750	593,900	571,000	618,350
Eastern states	106,050	106,400	.....	105,900
Illinois	324,850	363,600	.....	327,235
Kansas	199,700	188,400	192,400	199,050
Louisiana	289,990	280,300	287,246	287,175
North Louisiana	*68,690*	.....	.....	*68,375*
Louisiana Gulf Coast	*221,300*	.....	.....	*218,800*
Michigan	41,785	47,100	44,000	42,450
Mississippi	15,800	13,900	.....	13,355
Nebraska	3,100	2,000	.....	3,150
New Mexico	103,530	100,600	104,000	103,500
Oklahoma	391,875	422,600	390,000	384,450
Rocky Mountain states	93,680	98,100	.....	89,680
Texas	1,343,350	1,277,000	1,316,660	1,331,750
East Texas	*375,125*	.....	.....	*375,175*
West Texas	*219,675*	.....	.....	*218,250*
North Central Texas	*137,125*	.....	.....	*137,875*
East Central Texas	*83,250*	.....	.....	*81,525*
Texas Panhandle	*83,175*	.....	.....	*76,525*
Texas Gulf Coast	*354,150*	.....	.....	*346,450*
Southwest Texas	*90,850*	.....	.....	*95,950*
Total United States	3,603,165	3,560,310	.....	3,574,760

In regard to the domestic demand the outlook at the start of a year was never more favorable. The industry and the Government's economists have predicted gains in domestic gasoline demands ranging from 5.5 to more than 7 per cent. Substantial increases in the other principal products are in prospect. The Bureau of Mines in projecting a gain of 6.5 per cent in gasoline demand for January over January 1940, estimates that the overall increase in demand for all petroleum products next year will be 8 per cent. This expansion of more than 100 million barrels will be one of the largest in the industry's history.

Finally, those who are viewing the industry's position optimistically, feel that state conservation and proration enforcement will be on a better basis next year. Considerable importance attaches to the situation in Texas where the regulatory body is being reorganized and where allowable production for January has been established within the Bureau of Mines recommendation.

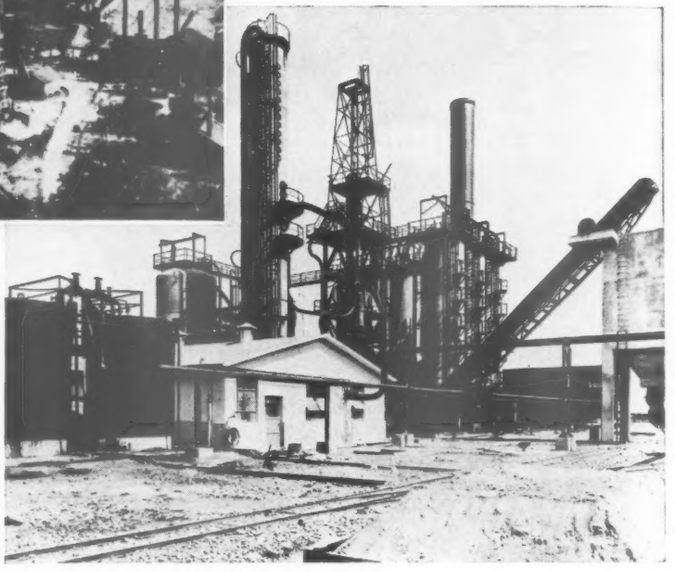


Petroleum Needs Direct Course of War

By J. P. O'DONNELL

Expansion of the Axis and the U.S.S.R. in Europe has made significant changes in the war arena's petroleum properties and spread its influences to practically every oil-producing country. This review interprets the significance of Axis and British moves and the trends portended.

Above: A portion of the Boryslaw (Drohobycz) field formerly a part of Poland but now in hands of the U.S.S.R. as a spoil of war



Cracking and coking section of a Rumanian refinery now turning out products for the exclusive use of the Axis

KALEIDOSCOPIC changes in the divisions of Europe have been brought about by the war now rounding out 15 months of varied intensity. And with the far-flung revisions of political boundaries there have been equally important and significant alterations in the ownership and distribution of petroleum.

The substantial producing fields, modern refineries and extensive crude reserves of Iran and Iraq are in immediate line of the drive projected beyond the German advance in Rumania and there is no question but that they are among the chief attractions in that direction.

All petroleum indigenous to Europe, exclusive of the U.S.S.R., is now in the hands or under the domination of Germany. Within the year, Germany has occupied a substantial portion of France, all the Low Countries, part of Scandinavia and has gained control of Hungary and Rumania. Expansion of Germany in western Europe includes only one significant acquisition of petroleum properties. Acquiescence of Rumania to German political rule and military occupation brought 42,500,000 bbl. of yearly crude production under Reich domination. Normally, Rumania consumes approximately 20,000,000 bbl. Restrictions on civil consumption and expansion of production are among the primary objectives of German technicians sent into Rumania in November. Rumania has nationalized all pipe lines thus removing any transportation obstacles of unfriendly policies.

Approximately 85 per cent of the modern refining capacity in France is in the occupied territory but their usefulness is dependent on damage inflicted during the invasion and the ability to obtain and deliver crude-oil supplies.

The light green portion of the facing map shows that, with exception of Rumania, conquests of the Axis actually constitute a liability from a standpoint of petroleum. Territory west of the San River, carved from what was formerly Poland, produces approximately 3,000 bbl. daily. Germany now has approximately 8,000,000 bbl. of yearly crude production from the Old Reich, Austria, Bohemia-Moravia, France and the western part of Poland. Hungary produces almost 2,000,000 bbl. and the trend there is upward. Rumania's 1940 production, estimated at 42,500,000 bbl., leaves at least 22,500,000 bbl. available for export and under the new order most of it will serve the Axis military requirements.

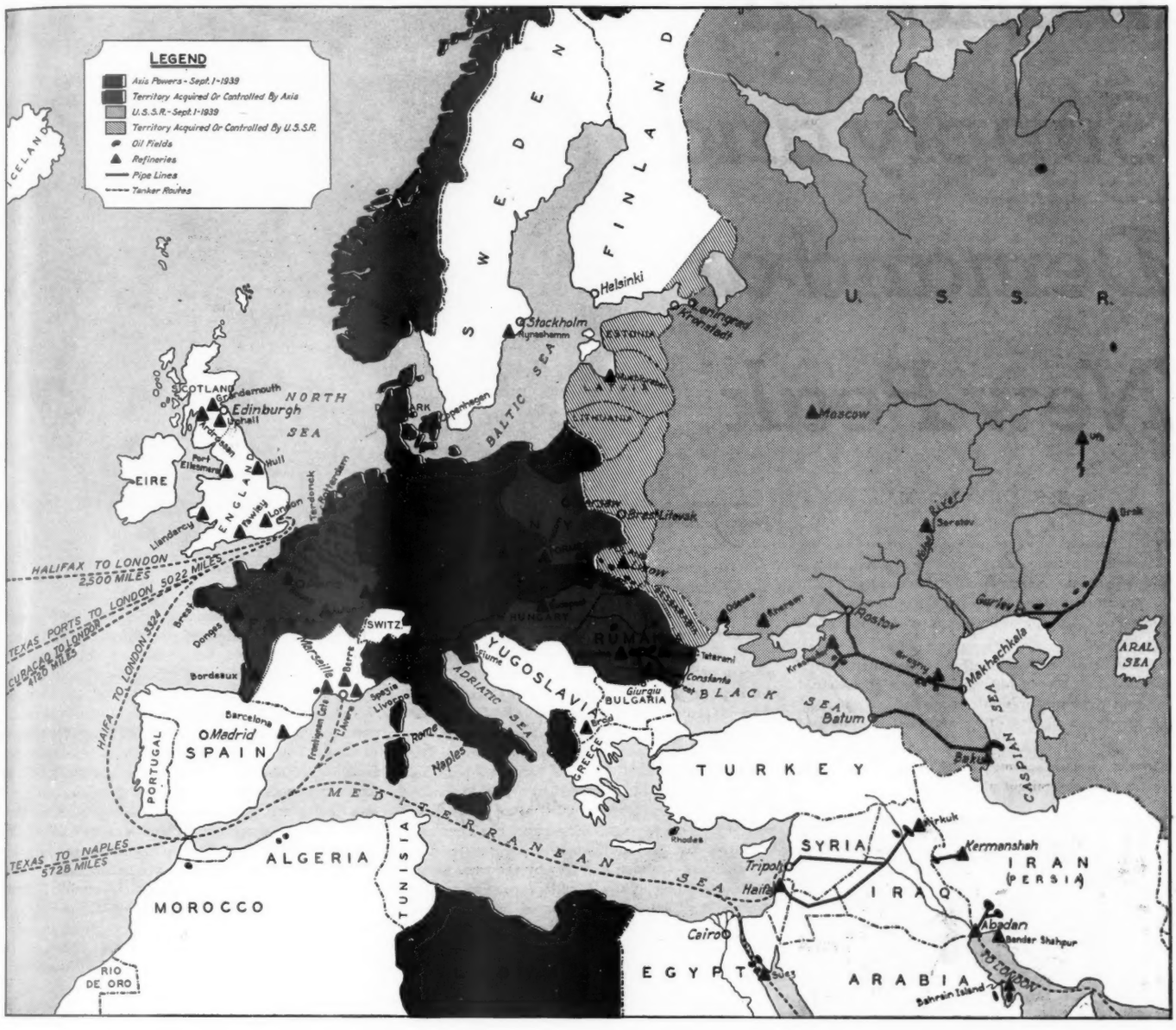
The total of 50,000,000 bbl. of annual crude production available to Germany is approximately equivalent to peacetime consumption within the Reich. The assumption that all 50,000,000 bbl. can be devoted to German requirements transcends logic since indispensable services cannot be reduced below a minimum without creating internal disorder.

The most potent result of Europe's war on the international petroleum industry has been emasculation of civil consumption. Peacetime consumption in western Europe, including all territory west of the self-sufficient U.S.S.R., was approximately 190,000,000 bbl. annually, or nearly 25 per cent of the world's total. No oil from the usual sources is reaching France, and only the trickle from Albania and a little from Rumania, totaling less than 5,000 bbl. daily, reaches Italy. The Scandinavian countries are isolated and Germany, except for her own output, is dependent on petroleum supplies from the U.S.S.R. and Rumania.

The British Empire normally consumes about 12 per cent of the world's total. Restrictions in the principal divisions, including Canada, British India, Australia, Union of South Africa and New Zealand, have been less severe than in other countries directly involved in the war. Imports have dropped in all British possessions, however, because of the need for conserving exchange.

Sixteen French refineries with aggregate capacity of 128,000 bbl. daily are in German-occupied territory. A modern refinery of 15,000-bbl. capacity at Rotterdam and seven plants in Belgium capable of processing 12,175 bbl. daily fell to Germany in the sweep through the Low Countries in April and May. Normally this total of 150,000 bbl. daily of refining capacity would be important to any nation but the British Navy blockade com-

WAR CHANGES OIL COMPLEXION OF EUROPE AND MEDITERRANEAN



All important petroleum facilities in the western part of continental Europe are now under Axis control as shown by the original territory in vivid green and that acquired by military or political conquest in shaded green. The U.S.S.R. has absorbed buffer territory leaving the two powers face to face

bines with the American and British ownership of exportable surpluses elsewhere in the world to render the refineries useless.

Oil refineries are No. 1 targets for the R.A.F. according to a summary of its raids on Reich territory. During the first 15 months of the war, British air communiques listed 204 attacks on oil plants. It is significant that only a few of these were made before the launching of "total" war in June so that practically all of them have been made in 5 months. Known mineral-oil refining centers which have been bombed in Germany and the number of attacks on each are listed by Petroleum Times of London up to October 31 were: Bremen, 10; Dortmund, 5; Emmerich, 4; Hamburg, 21; Hanover, 18; Misburg, 4; Monheim, 8; Ostermoor, 3; Regensburg, 1, and Reisholz, 6. Plants located in these places aggregate more than 33,000 bbl. in capacity or two-thirds of all the refining capacity of the Old Reich. Other oil targets, interpreted to be synthetic-refinery centers, attacked in this period follow: Atmisburg, 1; Bohlen, 2; Cologne, 8; Delmenhorst, 1; Duisburg, 1; Dusseldorf, 1; Emden, 3; Frankfurt, 6; Gelsenkirchen, 26; Hamburg, 12; Jena, 1; Kamen, 3; Kastrop-Rauxel, 3; Kiel, 3; Leuna, 6; Ludwigshaven, 3; Madgeburg, 12; Mannheim, 2; Nordenham, 2; Politz, 5; Salzbergen, 3; Salzhof, 1; Soest, 1; Sterkade, 6; Stuttgart, 1; Wanna Eickel, 3; Wesel, 1, and Wilhelmshaven, 1.

The manner in which the war has affected the international oil industry is important to this country since American capital constitutes a large part of the investment in the oil industry outside of United States. No official study of American investments in foreign countries has been made since 1936 when the foreign oil investments of domestic companies were placed at $1,075,000,000 by the Department of Commerce, almost one-tenth of the investment in the domestic industry.

INTERNATIONAL ISSUE FEATURES

- **A summary of outstanding international developments appears on Pages 60-66.**
- **The International Section starts on Page 76, and the Spanish-English Section, describing latest developments in operating practices, starts on Page 163.**
- **A 30 by 40-in. four-color oil map of South America, inserted in mail subscriber copies, showing fields, refineries, pipe lines, airlines and tanker routes.**

World Oil Supply and Demand at New Peak

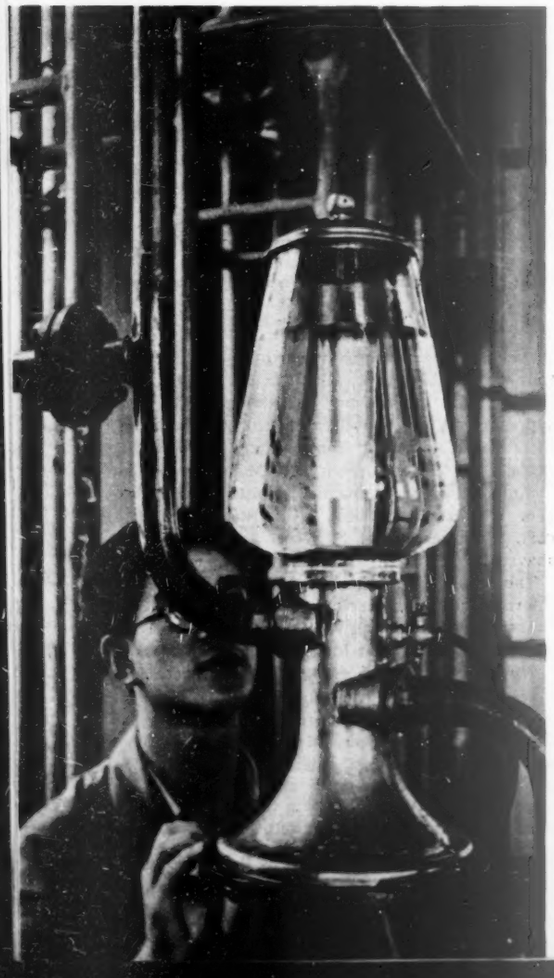
Field camp at Vespucio, Salta, northern Argentina

By H. STANLEY NORMAN

THE shock of readjustment forced on the world's petroleum industry by warfare has been absorbed. Expansion of civil consumption in the peaceful sections of the world outweighed the constrictions in the war arenas of the Far East and Europe.

World crude-oil production is estimated this year at 2,150,679,040 bbl., an increase of nearly 4 per cent over the previous record of 2,068,667,520 bbl. produced in 1939. Increased production and consumption in the Western Hemisphere were singularly responsible for driving the overall world oil operations to a new peak. Censorship of data of military significance—and oil is one of the most important commodities in this classification—closed some of the channels of information which are open in peacetime. Therefore, production estimates for Iran and Iraq, in addition to the countries actually at war, are based on indirect information but from usually reliable sources.

Japanese refinery operator watching a phase of the process in a government plant



Revision of the Europe political map, portrayed graphically on the preceding page, has been mild compared to the readjustments perpetrated upon the world's petroleum industry by the war.

Abnormalities in the world petroleum markets may be typified by a review of occurrences in the United States export trade. In the first full year of warfare, the United States exported 141,255,000 bbl. of crude and products, a reduction of 28.3 per cent compared to the 12 months immediately preceding hostilities. The following table tells the story:

UNITED STATES PETROLEUM EXPORTS

(Thousands of barrels)

Product—	Sept. 1938 through Aug. 1939	Sept. 1939 through Aug. 1940	Per cent reduction
Crude	71,121	60,041	15.5
Natural gasoline	5,217	2,183	58.1
Aviation gasoline*	2,919	3,207 }	
Other gasoline	37,047	21,236 }	38.8
Naphtha and solvents	1,613	649	59.7
Kerosene	7,700	5,401	31.1
Distillate fuel	29,514	22,975	22.1
Residual fuel	15,892	12,972	18.3
Lubricants	10,334	12,591	†21.8
Total	181,357	141,255	28.3

*Data for aviation gasoline not collected as such prior to January 1939. †Increase.

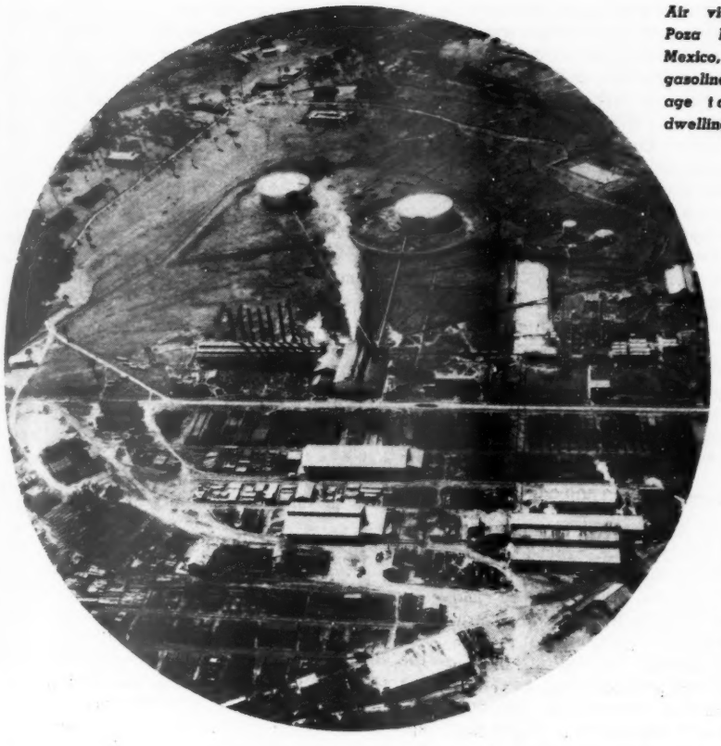
The most severe reaction from war restrictions was suffered by South and Central American oil operations. These sections of the Western Hemisphere normally supply a substantial majority of the petroleum demand in western Europe. Closure of normal outlets in Europe has forced South and Central American oil into other markets, creating a dislocation of varied extent.

Evidence that there have been readjustments in the international oil trade is furnished, for example, by Mexico. More than a fourth of Mexico's exports before the war were consigned to European countries, principally Germany and Italy. The combined markets of Germany and Italy are now lost to Mexico but increased shipments to the United States offset the European loss.

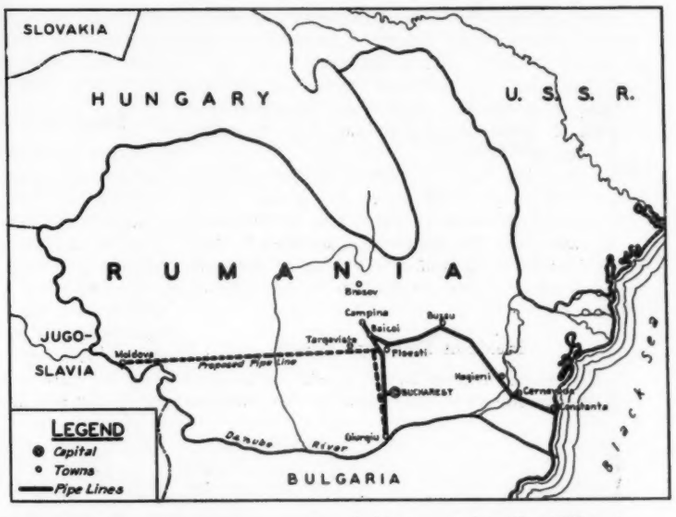
The extent to which the United States has relieved the pressure on Central and South American oil markets is disclosed in a 27 per cent gain in crude imports for the first 11 months and an increase of almost 20 per cent in receipts of refined products. Venezuela and Mexico are the chief suppliers of the petroleum imported by the United States. Improvement of Mexico's oil trade with the United States, brought about largely through negotiation of a crude contract with Consolidated Oil Corp. (Sinclair), enabled that country to overcome cessation of shipments to Germany and Italy. From the Mexican expropriation in March 1938 through the first three quarters of 1939, Germany and Italy had been the chief customers for Mexican petroleum.

Venezuela, the third largest producing country in the world, has suffered most from effect of war on petroleum operations in the Western Hemisphere. Venezuela's internal consumption totals approximately 10,000,000 bbl. annually, leaving 90 to 95 per cent of its recent production dependent on world markets. A year ago Venezuela exported more than 195,000,000 bbl. and substantial quantities of this total went to western Europe, Mediterranean countries and the Scandinavian Peninsula.

The North American continent expanded its domination of world petroleum production operations this year. The North American total production of 1,397,772,560 bbl., a daily average of 3,819,051, not only established a new peak but accounted for 65 per cent of the world aggregate. World production figures appearing in the accompanying table reflect the rather substantial change in conditions in South America and Asia. The four countries suffering outstanding reductions in production as a result of restricted markets are Venezuela, Iraq, Iran and Rumania. Normal depletion in the absence of customary drilling accounted for the decline of roughly 3,000,000 bbl. in Rumania. Declines in production elsewhere, however, may be directly charged to the European war.



Air view of the Poza Rica camp, Mexico, showing gasoline plant, storage tanks and dwellings



Outline map shows approximate routes of two pipe lines Germany proposes to build from Rumanian producing centers to the Danube River

Production increases in Argentina, which were entirely absorbed by the domestic market, and in Colombia were insufficient to prevent a net decline in South America. Restrictions on Venezuelan production which were entirely chargeable to constriction of the European market became increasingly severe during the last 3 months. There is evidence, however, that the floor has been reached in Venezuela and that operations there will at least hold their current level until conditions of war release restrictions.

The 10 per cent increase in Argentina's production, boosting it to a new peak of 20,476,100 bbl., is at variance with the figure of approximately 17,000,000 printed on the insert map. There was an error in the original transmission of figures for Argentina's production which since has been corrected. The substantial decline of 9 per cent in Venezuelan production, amounting to 28,860,000 bbl., reduced South American participation in world output. South America claimed 11.7 per cent of this year's total world production compared to 12.8 per cent in 1939. Most of the increase in Colombia was attributable to a full year's production from the Barco concession in the eastern part of the country which accounted for nearly 6,000,000 bbl. of the total.

Tropical Oil Co., operator of the De Mares concession, produces approximately 21,100,000 bbl., which is about 1,000,000 bbl. less than reported for 1939. There were no new discoveries reported for the year in Colombia although the active search launched with renewed vigor 2 years ago is still in progress. A Supreme Court decision invalidating titles to some leases obtained from private citizens in the middle of the year may tend to delay the exploration program. The court decision makes it necessary for the operating companies to deal with the government instead of individuals for subsoil titles to certain lands, but has no effect on any of the producing properties.

Routine work has proceeded in the Barco concession although the pace of development has suffered from the loss of European markets. There were 90 producing wells in the Barco concession at the end of June. The rate of drilling was curtailed approximately 30 per cent through the first half compared to the 1939 record. The drilling program in 1939 was predicated on completion of the pipe line to Covenas late that year and the curtailment in drilling this year has been scaled on a basis of maintaining production at previous levels.

Expansion of production and reserve supplies in the State of Anzoategui, eastern Venezuela, featured developments this year in that country. There are two new producing fields appearing for the first time this year in the Venezuelan table showing yields by fields. A new discovery late in 1940 effected by Mene Grande Oil Co. 1 Leona, 40 miles northwest of the Oficina field, indicates that substantial reserves have been opened in that general vicinity. The new Mene Grande discovery produced at the rate of 1,000 bbl. daily. Considerable exploratory drilling preceded completion of the Leona discovery and many of the wells drilled earlier were temporarily abandoned and may offer prospective expansion of the reserve when market conditions justify.

The two new fields appearing in the 1940 production table for the first time are El Roble and Tigre. Both fields were definitely determined productive in earlier years but did

WORLD CRUDE-OIL PRODUCTION BY CONTINENTS AND COUNTRIES

(Figures in barrels, partly estimated)

Continent and country—	1940	1939	Daily average 1940	Daily average 1939
North America:				
Canada	8,549,760	7,743,320	23,360	21,215
Mexico	43,470,000	42,897,500	118,770	117,527
United States	1,345,752,800	1,255,783,540	3,676,921	3,440,503
Total North America	1,397,772,560	1,306,424,360	3,819,051	3,579,245
Per cent of world	65.0	63.2		
South America:				
Argentina	20,476,100	18,614,660	55,946	50,999
Bolivia	101,000	115,000	276	315
Colombia	26,864,400	23,774,150	73,400	65,135
Ecuador	2,475,000	2,354,370	6,762	6,450
Peru	12,451,300	13,496,880	34,020	36,978
Venezuela	189,210,000	208,070,000	516,967	570,055
Total South America	251,577,800	266,425,060	687,371	729,932
Per cent of world	11.7	12.8		
West Indies:				
Cuba	113,450	107,540	310	295
Trinidad, British West Indies	20,300,000	19,270,000	55,464	52,794
Total West Indies	20,413,450	19,377,540	55,774	53,089
Per cent of world	0.9	0.9		
Europe:				
Germany*	8,000,000	7,500,000	21,858	20,548
Hungary	1,975,000	1,055,000	5,396	2,890
Italy†	1,479,500	1,025,000	4,042	2,808
Rumania	42,500,000	45,640,100	116,120	125,041
U.S.S.R.‡	224,000,000	216,500,000	614,755	593,151
Total Europe	278,954,500	271,720,100	762,171	744,438
Per cent of world	13.0	13.1		
Africa:				
Egypt	6,617,280	4,415,000	18,080	12,096
Other Africa	38,450	35,000	105	96
Total Africa	6,655,730	4,450,000	18,185	12,192
Per cent of world	0.3	0.2		
Asia:				
Bahrein Island	7,200,000	7,588,560	19,672	20,791
British India	2,150,000	2,164,000	5,874	5,929
Burma	7,750,000	7,396,000	21,175	20,263
Iran (Persia)	76,290,000	77,030,000	208,443	211,041
Iraq	25,720,000	30,790,000	70,273	84,356
Japan (including Taiwan)	2,700,000	2,654,000	7,377	7,271
Netherlands East Indies§	68,700,000	68,684,000	187,705	188,175
Saudi Arabia	4,770,000	3,933,900	13,033	10,778
Total Asia	195,280,000	200,240,460	533,552	548,604
Per cent of world	9.0	9.7		
Miscellaneous	25,000	30,000	68	82
Grand total	2,150,679,040	2,068,667,520	5,876,712	5,667,582

*Includes Austria, Bohemia-Moravia, occupied France, and what was formerly Poland west of San River. †Includes Albania. ‡Includes Sakhalin and Upper Ukraine, formerly part of Poland. §Includes Sarawak and Brunei.

not figure in Venezuela's commercial petroleum supply previously. Production from the new fields is currently connected with the main 16-in. trunk line extending from the Oficina field to the Caribbean Coast.

Two Other New Fields

In addition to the Leona discovery and the two new shipping fields, the Texas Co. (Venezuela) has been moving small amounts of oil in recent months from its Los Caritos discovery in the State of Monagas. The company is drilling on third and fourth tests in the district after the second location proved disappointing. Socony-Vacuum Oil Co. has succeeded in developing production on its Socororo property in Anzoategui. Most of the drilling in eastern Venezuela this year has been concentrated in the Oficina district and between that important high-gravity field and the El Roble area to the north.

There was a substantial decline in the last-quarter production from the Lagunillas field, probably indicating a temporary lull in demand for residual fuel.

Production from the entire Lake Maracaibo district, which produces mostly low-gravity crude, declined approximately 52,000 bbl. in daily average this year. The decline was accented in October by another drop of 3,000 bbl. in the daily output from Lago Petroleum Corp.'s Lagunillas operations.

Mexican Embargo Eased

Mexico, the second largest producing country in North America and third in the Western Hemisphere, succeeded in denting the virtual embargo against its oil that existed in many foreign markets for 2 years. Consolidated Oil Corp. negotiated an independent settlement of its claims for expropriated properties. A crude purchase contract covering 5,000,000 bbl. of Mexican oil annually was negotiated by Consolidated and Petroleos Mexicanos, the government company, simultaneously with the indemnification. Deliveries were made by Mexico against this contract for three-quarters of the year and these served to offset the loss of German and Italian markets resulting from the European war.

Mexico's crude production increased to approximately 43,470,000 bbl. this year compared to 42,897,500 bbl. in 1939. The modest gain was significant chiefly because it developed despite closure of European markets. Without the partial unblocking of the United States market Mexico's nationalized oil industry would have been sorely pressed in light of war developments.

Monthly Average Over 3,000,000 Bbl.

Mexico's production consistently exceeded 3,000,000 bbl. per month this year and ranged up to a peak of 3,969,411 bbl. in July, according to data covering the first 9 months. The Poza Rica field supplies more than 70 per cent of Mexico's production and the 9 months' high from that reserve was 2,665,966 bbl. in March. The North Tampico district and the Isthmus area are almost even in the volume of production reported for 1940. The South Tampico section registered a year's low output figure of 151,124 bbl. in April and a peak of 658,953 bbl. in July.

Typical scene of the Lagunillas field, Lake Maracaibo, Venezuela, showing extent of submarine drilling

Poza Rica crude, the most attractive gasoline-bearing stock produced in Mexico, accounts for approximately 70 per cent of the exports which will total more than 13,500,000 bbl., possibly reaching 15,000,000 bbl. this year. Internal petroleum consumption in Mexico is indicated at about 30,000,000 bbl. annually.

The 1941 exploitation program in Mexico calls for a total of 15 wells, including six in Poza Rica. Reports do not indicate that extensive work will be done in the refining branch of the Mexican industry next year. Refinery operations are of decreasing importance in Mexico because export demand is leaning progressively heavier to crude. Mexican refineries have an aggregate rated capacity of 99,800 bbl. daily, which is approximately 122 per cent of the internal consumption.

Gain Largely in United States

The United States gain of 89,969,260 bbl. in production was the most important factor in world and Western Hemispheric increases to new peaks. Domestic consumption has increased more than 7 per cent but losses in export trade will reduce the final net to 3 or 4 per cent.

Canada Surges Higher

Exigencies of pilot and troop training in Canada and the efforts made there as in other parts of the British Empire to conserve exchange were the chief factors in elevating Canadian production to a new record of 8,549,760 bbl., a gain of approximately 800,000 bbl. over 1939. There were no developments in Canada indicating significant expansion of reserves. The bulk of Canadian production, probably 95 per cent of the total, comes from the Province of Alberta, where the Turner Valley field is situated.

Argentina Increases 10 Per Cent

The 10 per cent increase in Argentina's production was made possible by vigorous exploratory efforts of the government company, Yacimientos Petroliferos Fiscales. The yield of 20,476,100 bbl. in 1940, compared to 18,614,660 bbl. in 1939, still makes up only 60 per cent of the consumption. Extensive new reserves in the Tupungato and Lunlunta districts of the Province of Mendoza, western Argentina, are playing important roles in bridging the gap between domestic production and consumption. Imports to cover the deficiency are drawn from the Netherlands West Indies, Colombia and the United States.

Bolivian Operations Static

Relatively little change was reported this year in Bolivian and Ecuadorian operations. The Bolivian Government is still in possession of properties originally developed by Standard Oil Co.

VENEZUELA SUMMARY OF PRODUCTION AND WELLS

	1939		9 months, 1940		Total to October 1	Well data as of October 1, 1940								Wells completed Jan.-Sept.
	Total production	Daily average	Total production	Daily average	1940	New wells drilling	Natural flow	Gas/air lift	Pumping	Closed in	Inactive	Abandoned	Total wells drilled	1940
North fields	24,932,365	68,308	15,572,483	56,834	380,195,661	1	81	22	568	231	280	119	1,301	39
Tia Juana	49,399,719	135,342	28,633,893	104,503	146,754,772	0	95	18	241	159	16	2	531	28
Lagunillas	71,926,356	197,058	49,887,803	182,072	937,697,394	3	223	0	667	316	125	75	1,406	85
Bachaquero	3,473,708	9,517	1,251,967	4,570	5,605,141	2	18	0	0	27	26	0	71	29
Total Lake fields	149,732,148	410,225	95,346,146	347,979	1,470,252,968	6	417	40	1,476	733	447	196	3,309	181
La Paz and Concepcion	1,460,637	4,002	994,302	3,629	27,127,807	0	2	0	72	44	17	6	141	4
Tarra and Manueles	5,689,726	15,588	4,816,365	17,578	60,940,986	3	17	0	55	14	25	15	126	3
Mene Grande	12,464,700	34,150	8,228,090	30,029	217,586,602	3	42	18	103	113	123	23	422	16
El Mene and Media	430,939	1,181	254,755	930	24,535,606	0	0	39	37	0	41	207	324	0
Cumarebo	2,667,434	7,308	1,381,256	5,041	25,903,668	0	13	0	15	54	22	14	118	1
Quiriquire	26,581,672	72,827	16,438,082	59,993	167,017,531	0	110	0	0	130	41	15	296	0
Pedernales	1,904,983	5,219	1,369,077	4,997	6,751,331	0	8	0	0	5	2	4	19	0
Temblador	3,664,093	10,039	2,975,966	10,861	9,023,217	0	58	0	0	15	8	15	96	0
Oficina	2,347,669	6,432	10,299,435	37,589	12,842,054	13	83	1	0	7	9	10	110	71
Jusepin	512,324	1,404	3,107,408	11,341	3,623,524	2	39	0	0	13	0	1	53	32
San Joaquin	39,923	109	672,396	2,454	713,811	4	6	0	0	0	0	0	6	2
El Roble	.....	.....	385,792	1,408	387,841	2	2	0	0	0	0	0	2	1
Santa Ana	24,374	67	66,868	244	102,286	0	2	0	0	0	0	0	2	1
Tigre	.....	.....	9,301	34	9,532	0	1	0	0	0	0	1	2	0
Hombre Pintado	489,932	1,342	499,776	1,824	1,357,054	1	18	0	3	0	8	6	35	8
Las Palmas	59,493	162	35,894	131	342,191	0	0	0	3	1	5	4	13	0
Others	.....	.....	7,976	29	3,422,977	8	0	0	0	40	12	336	388	12
Total Venezuela	208,070,047	570,055	146,888,885	536,091	2,031,940,986	42	818	98	1,764	1,169	760	853	5,462	332

of Bolivia. The government has reclaimed the sparsely developed properties alleging breach of contract. Operations there will not change materially until pipe-line outlet can be financed and markets established outside the country.

Peruvian Slump Continues

Routine operations were insufficient to maintain Peruvian production. The declining production curve continued its course of the 2 preceding years in 1940 and there is no indication that the course can be altered in the near future. Exploratory operations are continuing in the Agua Caliente concession on the Pachitea River and in the older fields on the coastline.

The La Brea-Parinas field, operated by International Petroleum Co., Ltd., furnishes 78 per cent of Peru's production. Lobitos Oilfields, Ltd., accounts for 21 per cent. Remote location of the Agua Caliente operation from established arteries of transportation leaves its commercial importance yet to be determined.

British Draw on Trinidad

The comparatively near exportable surpluses of petroleum in Trinidad were attractive to the British. The exchange advantages in dealing with members of the Empire stimulated withdrawals of oil from the Caribbean island. Censorship of Trinidad information prevents an elaboration on operations but an increase in production to approximately 20,300,000 bbl., constitutes a gain of more than 1,000,000 bbl. over 1939.

U.S.S.R. Short of Plan

The U.S.S.R., second largest producing country in the world, fell about 28,000,000 bbl. short of its planned output for 1940 despite the acquisition of about 3,000,000 bbl. in western and upper Ukraine which was not considered in the original program. The 1940 production of 225,000,000 bbl. represents an increase of approximately 4 per cent over 1939 and is a little more than 10 per cent of the world total.

Development of submerged producing properties underlying the shallow waters flanking the Apsheron Peninsula in the Caspian Sea has been one of the 1940 highlights in U.S.S.R. operations. Artem Island is now an important producing field and the development is particularly intensive in Ilyich Bay, near Bibi-Eibat. The sub-Kermak series at about 6,700 ft. around the Apsheron Peninsula is the chief source of new production. A still lower pay, called the Kalinsky, has been proven productive at Kala, also on the Caspian seacoast. A new pool has been developed in the Azerbaidjan region at Siazan. Exploration and exploitation continue on an intensive scale in the Ural-Volga region and elsewhere.

Reports obtained from the U.S.S.R. and reviewed more extensively starting on Page 115 of this issue indicate that prospecting operations have been prosecuted with renewed vigor in 1940. A total of 490 geological parties were reported organized this year.

The Soviet trusts are exporting limited quantities of petroleum to Germany but the bulk of production is consumed internally.

Indications are that more vigorous search will be continued in 1941. The recent shipment of 40 heavy-duty rotary drilling units from the United States for service in the fields along the Caspian seacoast portends an aggressive operating policy.

Near East Chief Sufferer

Iran and Iraq petroleum operations suffered most from the war so far as countries in Asia are concerned. Iraq production declined more than 5,000,000 bbl. this year compared to 1939. The estimated output of 25,720,000 bbl. for 1940 may prove too liberal when more detailed information is permitted to pass censorship. The northern leg of the Iraq pipe line to the eastern end of the Mediterranean was closed, according to reports, when France fell to Germany. The northern branch of the line normally handled 15,000 to 20,000 bbl. of crude daily and most of it went to supply French refineries. Fall of France prevented further deliveries and, furthermore, Iraq operations are directed by Iraq Petroleum Co., Ltd., predominantly British in character. Closure of the Mediterranean shipping lanes to peacetime traffic reduces the demand for the Iraq crude to the requirements of the Consolidated Refineries, Ltd., plant at Haifa, which has been reported bombed at least once.

Iranian Decline Modest

Iranian production is estimated at 76,290,000 bbl. for the year, a reduction of only 800,000 bbl. Incomplete information indicates that the operations in Iran have been maintained at a level approximating peacetime conditions. Anglo-Iranian Oil Co., Ltd., the sole operator in Iran, is owned 50 per cent by the British Government and this alone is sufficient to justify the reports that operations there have been maintained near normal. The longer, but safer, tanker route around the south tip of Africa and then up the Atlantic coastline has been used extensively by the British. Sacrifice of time in moving oil from Iran has been possible through use of Norwegian, Netherlands and Danish tankers since the middle of the year.

Consumption in the Near and Far East has been altered to a relatively slight degree.

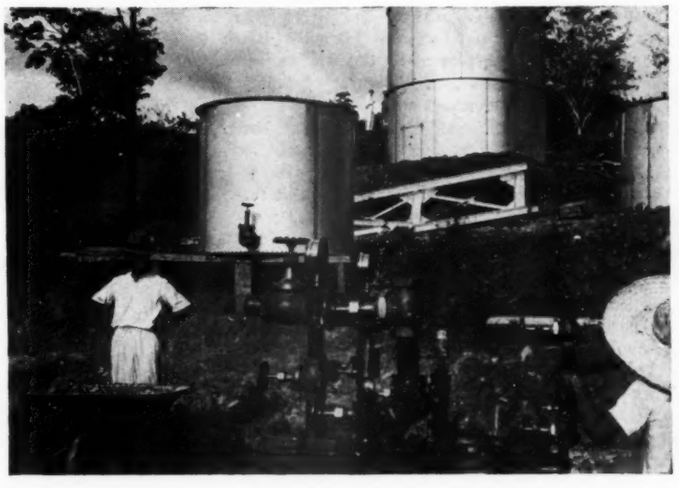
East Indies Unchanged

The Netherlands East Indies produced almost exactly the same this year as last. Drilling was maintained at a moderately modified rate, principally because of the uncertainty existing during most of the year over the designs of Japan. Agreement has been reported reached whereby Japan will receive approximately 10,000,000 bbl. of oil from the Netherlands East Indies in 1941.

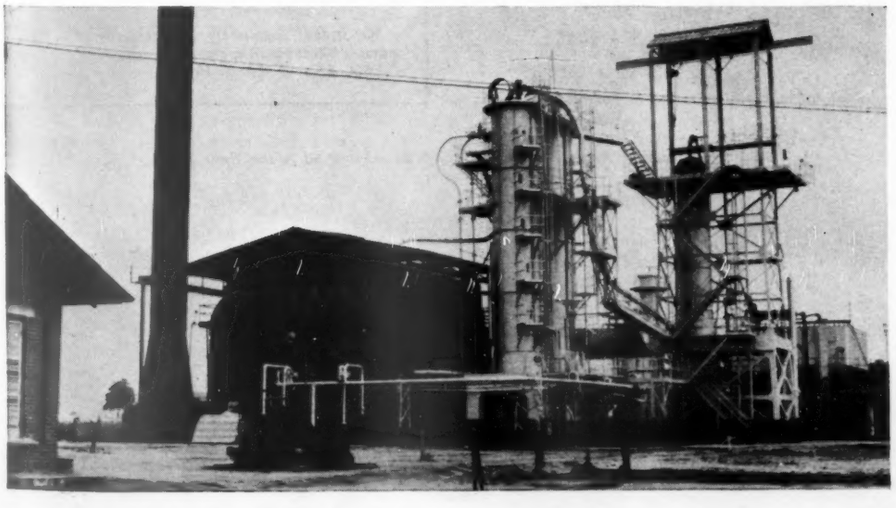
Persian Gulf Stable

There was no net change in the Persian Gulf producing regions. Bahrein Island and Saudi Arabia produced a combined total this year of 11,970,000 bbl. compared to 11,522,000 bbl. in 1939. There was a slight internal shift involving an increase in Saudi Arabia and a decrease in Bahrein Island production but the two operations are closely related from a standpoint of available markets and refining capacity. Saudi Arabian crude moves by short pipe line to Ras Tanura and across to Bahrein Island for refining in Bahrein Petroleum Co.'s 32,500-bbl. plant or into the world market as crude.

Right: Boiler-feed unit and tanks at Bahia, Brazil, location



Below: Cracking section in Minatitlan, Mexico, refinery



Egypt Up 50 Per Cent

One of the most substantial increases in production for the world from a percentage standpoint was scored again this year by Egypt. The country, only casually exposed to the European war so far, is normally an importer of considerable crude. The deficiency of production explains in part why an increase was possible despite war hazards. The Anglo-Egyptian Oilfields, Ltd.,

continued exploitation of its Ras Gharib field has been an important factor in Egyptian petroleum economy since the middle of 1938. Total production of 6,655,730 bbl. this year is nearly 50 per cent greater than 1939 output.

Germany's Supplies Limited

The status of Germany's indigenous petroleum supplies has been cloaked in mystery for 2 years. Estimates at the outset of the war crediting Germany with sufficient stocks and reserve production to conduct total combat for 2 years were considered almost fabulous in more conservative quarters. Subsequent events have indicated that original estimates were approximately correct.

Information available, meager though it is in many respects, does not indicate that substantial change has been precipitated by the war in Germany's internal production. Conquest of Poland west of the San River added approximately 1,000,000 bbl. annually to the German supply, but this section, containing numerous industrial centers, consumes more than it produces. Consequently, receipts of shipments from the western Ukraine territory of U.S.S.R. are only partially available for other than industrial consumption.

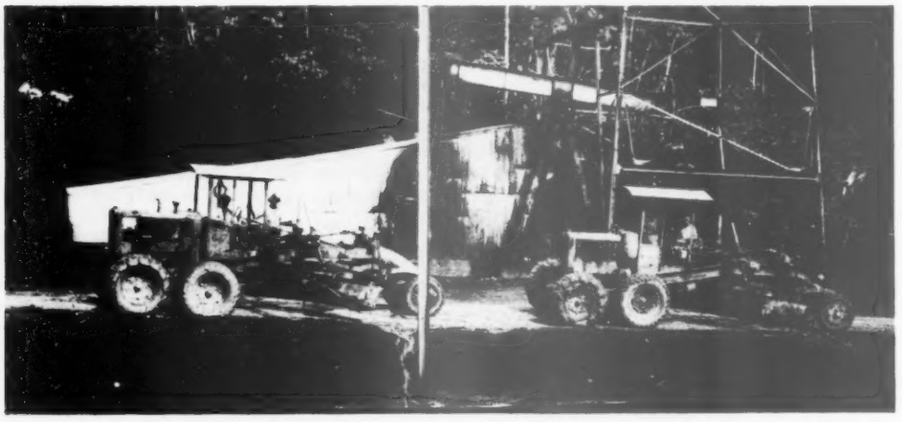
Gains of Aggression

The Pechelbronn field in northwestern France is part of German-occupied territory and that production is available to the Reich.

The recent signing of treaties with Hungary, where production under the management of the Hungarian-American Oil Co. has expanded rapidly, and Rumania, only European country west of Russia with a normally exportable surplus, have strengthened Germany's position. To her own annual production of 4,500,000 bbl. she has added Austria's 700,000 bbl., France's 500,000 bbl., Poland's 1,130,000 bbl., Hungary's 2,000,000 bbl. and Rumania's 42,500,000 bbl. to serve herself, her partners and the subjugated countries. This total of 50,830,000 bbl. per year, 139,000 bbl. a day, is little more than Germany alone consumes normally and far from sufficient for normal economic operations in Europe.

Germany, with at least 25 synthetic oil plants, is best situated from this standpoint, though the repeated R.A.F. raids may have decreased her productive capacity. Most of the mineral-oil refineries in Europe have been rendered temporarily useless by lack of fuel as well as by bombing. Crude-oil production in Europe, west of Russia, is estimated at 155,000 bbl. per day and since these countries have a refining capacity of 600,000 bbl. per day it is obvious that about 75 per cent of this capacity must be shut down.

Importance of the Mediterranean closure can be gaged by the fact that major European importing countries received approximately 93,000,000 bbl. of their annual requirements through these waters prior to the war. Receipts by countries in the last full year of unrestricted passage through the Mediterranean were: United Kingdom, 29,000,000 bbl.; other British possessions, 1,750,000; France, 27,000,000; French possessions, 4,000,000; Italy, 18,000,000; Italian possessions, 500,000; Egypt, 4,800,000; Greece, 2,400,000; Spain, 2,100,000, and other western European countries, 2,800,000 bbl. Sources of Mediterranean oil traffic were: Iraq, 29,280,000 bbl.; Iran, 19,500,000; U.S.S.R., 3,000,000; Rumania, 8,000,000; Netherlands East Indies, 2,500,000; United States, 7,200,000; Colombia, 800,000, and other countries, 23,000,000 bbl. Most of the oil entering the Mediterranean trade from "other countries" originated in Venezuela and Mexico. Venezuelan oil normally passes through the Netherlands West Indies.



Highway maintenance equipment in service on Colombian oil-field roads

Exploration crew operating in Persian Gulf area

The World's Refineries

The capacity of the world's 877 refineries is 7,837,540 bbl. daily and they are equipped to crack 3,387,600 bbl. daily. Nearly 51 per cent of the crude capacity and about 42 per cent of the total refineries are outside the United States. Germany now occupies territory completely or partially that contains 131 refineries with a crude capacity of 483,345 bbl. daily.

The following table is a recapitulation of the capacity by countries compiled from the detailed survey starting on Page 93 of this issue. Censorship prevented procurement of new detailed information on plants in the war zone and in a few other countries.

A detailed survey of producing fields by countries starts on Page 84.

	No. of refineries	Daily crude capacity	Daily cracking capacity
Argentina	19	94,230	60,100
Australia	3	4,100	1,000
Bahrein Island	1	32,500	12,000
Belgium*	7	12,175	2,300
Belgian Congo	1	250	150
Bolivia	2	725	.....
Brazil	3	6,460	.....
Canada	54	221,850	87,500
Canary Islands	1	5,000	4,100
Chile	3	535	.....
Colombia	2	14,500	.....
Cuba	1	4,200	2,100
Denmark*	1	500	.....
Ecuador	3	7,350	.....
Eire	1	600	.....
Egypt	2	17,000	4,100
France*	19	151,500	72,900
Germany	47	68,770	7,920
Hungary	7	11,670	350
India and Burma	7	37,000	10,600
Iran	3	333,000	155,000
Iraq	2	4,000	.....
Italy	10	57,300	28,600
Japan	17	52,600	16,250
Latvia†	1	200	.....
Libya	1	2,000	.....
Manchuria	1	3,000	850
Mexico	7	99,800	18,830
Netherlands*	1	15,000	12,500
Netherlands E. I.	7	160,000	28,500
Netherlands W. I.	3	505,000	338,200
Norway*	1	1,200	.....
Palestine	1	40,000	20,000
Peru	3	22,000	6,800
Portugal	1	5,000	1,500
Poland*†	19	23,050	2,300
Rumania*	48	224,200	49,200
Sarawak, B. E. I.	1	20,000	.....
Spain	1	1,500	.....
Sweden	1	3,500	2,700
Trinidad	7	79,300	28,350
Union of South Africa	1	1,000	.....
United Kingdom	18	133,450	20,500
United States‡	506	4,636,900	2,189,100
Uruguay	1	5,000	2,000
U.S.S.R.	19	637,500	178,500
Venezuela	9	76,325	22,800
Yugoslavia	3	4,800	.....
World total	877	7,837,540	3,387,600

*Occupied completely or partially by Germany. †Occupied completely or partially by U.S.S.R. ‡As of March 1940.

Tank trucks of Anglo Iranian Oil Co., Ltd., moving oil in the Near East

Oil Industry Holds Large Stake In South American Trade Plan

By HENRY D. RALPH

WASHINGTON, D. C., Dec. 24. — Under the complicated name of the Office for Coordination of Commercial and Cultural Relations Between the American Republics, the Roosevelt administration has established a small organization to deal with the complicated task of increasing the volume of trade between the United States and the countries of South and Central America.

There is nothing particularly novel in the program of this office, for both governmental and private agencies have for years been endeavoring to increase trade, travel and understanding in this hemisphere. What is new is the fitting of all aspects of this work into a single program and coordinating the efforts of many public and private agencies in a single central office.

The head of this office is Nelson A. Rockefeller, 32 years of age, eldest of the five sons of John D. Rockefeller, Jr., and a grandson of the late John D. Rockefeller, founder of Standard Oil. Mr. Rockefeller brings to his new office more than the prestige of his name and the enthusiasm of his youth. He speaks Spanish and has traveled throughout South America. He was a director of the Creole Petroleum Corp. which operates in Venezuela, and only a few months before entering government service he helped form the Venezuelan Development Co. (Cia. de Fomento Venezolana) designed to bring both United States and Venezuelan capital together in various enterprises to diversify the industries of that country. One of the first projects of this concern was the construction of a modern hotel in Caracas, capital of Venezuela.

Is Branch of Defense Council

The Office of Coordination was created by executive order last August and functions as a branch of the Council of National Defense, but reports directly to the president. Mr. Rockefeller serves as chairman of the previously formed Interdepartmental Committee on Inter-American Affairs, composed of representatives of the Department of State, Department of Commerce, Department of Agriculture, Department of the Treasury, Export-Import Bank, and the National Defense Advisory Commission. The coordinator's staff is divided into commercial and cultural sections, with subdivisions in each section, and is financed by an allocation from appropriations for national defense.

The national-defense aspect of the coordinator's office is most important at present, though most of its program is designed to be of permanent value long after the emergency has passed. Our foreign policy is based on the concept of hemispherical solidarity, an implemented Monroe Doctrine, and the first problem is to help the Latin American countries offset the serious economic blow caused by the loss of most of their European markets due to the war. This is much more than a selfish desire to grab off new markets for ourselves while our European competitors are otherwise occupied; the program is grounded on a realization that if the Latin American countries should become economically bankrupt they would be unable to defend themselves against military aggression from abroad. Military cooperation between the American republics is outside the scope of Mr. Rockefeller's office, but his emergency program for increasing the volume of trade between the United States and those nations is a vital part of our own defense measures.

Emergency measures to tide several of the republics over the present crucial period are being given first consideration. The Export-Import Bank has made several loans to increase the dollar exchange of Argentina and other nations, and

Underwood & Underwood

Nelson A. Rockefeller, who was recently appointed coordinator of commercial and cultural relations between the American republics

further loans are under consideration. In most cases the entire proceeds of these loans are spent in the United States for materials vitally needed and which previously were purchased in Europe. Another emergency-assistance measure is the use of funds by the Treasury Department to assist in stabilizing South American currencies. This money comes from the stabilization fund created when the gold content of the dollar was reduced. Up until recently this fund was used only in connection with stabilizing the value of the U. S. dollar, English pound, and French franc, but congressional committees have given informal approval for use of the stabilization fund in connection with South American currencies. Another emergency measure is the purchase of strategic defense materials within the hemisphere. The War and Navy departments and the Reconstruction Finance Corp. both are purchasing large quantities of important raw materials in order to have a reserve stock pile in case war conditions should make it difficult to obtain needed imports. Some of these imported materials cannot be obtained in this hemisphere, but wherever this is possible the coordinator arranges with the purchasing officers to give priority of consideration to the American republics. Arrangements are under way to purchase manganese from Brazil and Cuba, tin ore from Bolivia, copper and nitrate from Chile, hides from Argentina, and various other materials needed in our defense program.

Possibilities of new tropical agricultural products which will not compete with North American crops are being studied by the U. S. Department of Agriculture, which has several experts now in the field. Rubber is one possibility, since Brazil is the native home of the rubber tree and varieties of it can be grown in various parts of the tropics. A number of experimental rubber plantations have been set out, but it will take many years before any important production can be expected. Other possibilities are rare hardwoods, spices, coarse fibers, tropical starches, fruits, and wines.

Surveying Mineral Deposits

In fostering new basic industries Mr. Rockefeller is proceeding with caution lest he arouse opposition from domestic interests who fear their export markets may be lost, but analysis shows that the neighboring nations can make many things which they formerly imported from Europe but not from the United States. The biggest step in this program was the loan of $20,000,000 by the Export-Import Bank to Brazil to be used in connection with Brazilian capital in building a modern steel plant. This plant will use local coal and iron ore and will produce the lighter steel products formerly imported from Europe such as wire, nails and roofing, but will not make rails and structural shapes which this country has been selling to Brazil. As Mr. Rockefeller expresses it, "Brazilian labor which at present is producing coffee it can't sell will in the future be engaged in the production of steel which today it can't buy."

As a part of this program the U. S. Department of the Interior has assigned eight geologists to survey mineral deposits in Latin America and report on the possibilities of their commercial exploitation. They are working particularly on manganese and chromite in both Brazil and Cuba, and tin, tungsten and antimony in Bolivia.

There are many barriers to increased business relations between the United States and the countries to the south of us, such as default on past debts, expropriation of American property, and distrust of American "imperialism," exploitation of resources, and mixing in local politics, but Mr. Rockefeller feels that these can all be overcome through careful cooperation, the basis of which must be better mutual understanding.

So far the oil industry has not entered the sphere of Mr. Rockefeller's work as coordinator, and he has nothing to do with political and diplomatic matters such as United States tariffs on imported oil or negotiations over expropriated oil properties in Mexico. His staff, however, does feel that United States oil companies operating in Latin American countries, either in production or distribution, can assist the program in numerous ways and at the same time benefit themselves.

SPARKS . . . FROM THE NEWS

MYSTERY CLEARS: The mystery as to who is behind the Cole bill was cleared last week when the president let it be known that he wants the bill to become a law, as is.

WAX AS FOOD: Researchers explain that petroleum wax which has been shipped abroad has gone into the manufacture of soap and food fats. Another example of how chemistry can help the petroleum industry to expand its usefulness.

OIL, PLEASE: California was chagrined to think of heating its new soldiers' training camps with coal as specified. So, the specifications have been revised and in the future stoves will be provided to burn either fuel oil or butane.

NEWNESS: The Texas Railroad Commission starts the year with a new member, a new chairman and a new head of the conservation division. The oil industry hopes that this newness will include some of the commission's policies.

READY-MADE EXPERTS: If the Army is really going in for mechanization, it should send potential tank drivers to the oil fields for a course in how to transport equipment in bad weather. There also might be additions to the Army's famed vocabulary.

FRANKNESS: On a drilling report it was shown that an independent producer's well was "shut down for the holidays." Not a bad idea including the frankness.

1940 IN BRIEF: Petroleum supply and demand in the war-torn Eastern Hemisphere decreased. Gains ruled in the peaceful Western Hemisphere.

1941 QUESTION: Developments at a 2½-mile extension test are increasing interest in the Woodbine sand play of Wood County, Texas. Will this be the first big boom of 1941?

CHANGED CONDITIONS: It wasn't very long ago that 3,000 ft. was a deep test in West Virginia. Now they are drilling one below 9,500 ft.

EASTERN VENEZUELA LEADS: In regard to supplies outside the United States, reports in this International Number reveal that eastern Venezuela leads in important discoveries for 1940.

SOLVING THE MYSTERY: The Trenton lime in Illinois has been held over the heads of the oil industry. Latest report is that the Trenton test in the Salem field is nearing the hoped-for "pay" horizon.

IMMEDIATE PROBLEM: The immediate problem for 1941 is the correction of the year-end situation which finds gasoline prices at the lowest levels since motor fuel became the industry's principal product. A gain of 6 or more per cent in demand for 1941 should be helpful, but will it?

CAMOUFLAGE: A manufacturer of hydraulic pumping systems is considering marketing possibilities for an "invisible" installation for pumping an entire oil field in war-threatened areas. Using no derricks, and with a surface hydraulic pump in a bomb-proof cellar, the entire field could be disguised as an alfalfa field.

NO WAR BABY: The oil industry has now learned that prices rise during a war only when there is a deficiency in supply. The rule works even better during peace when there are fewer restrictions on demand.

REVISE ESTIMATE: Estimates of the coming months' gasoline consumption should not overlook the automobile industry's revision upward of December car sales. Current deliveries of cars indicate the sale of 500,000, a new peak.

IN FAR EASTERN TROUBLE ZONE . . .

Wide World

This view shows a part of the huge supplies of gasoline and oil stored in drums on the grounds of the North American Syndicate at Haipong, French Indo-China. At the right is an air-raid shelter with sandbags covering the entrance. In the background is the Red River which flows into the Gulf of Tonking where the Japanese have broadened their demands for more bases

Extra Shutdown Day May Relieve Texas Oil Market

By NEIL WILLIAMS

The oil industry can announce, and it has repeatedly announced, that it is ready for any call that can be put on it to answer national-defense needs, declared Ernest O. Thompson at Austin, chairman of the Texas Railroad Commission. "Certainly the oil industry is to be congratulated on being ready to take advantage of this opportunity to do its bit for freedom. The oil industry can look to 1941 for the most prosperous year since 1937," he declared.

HOUSTON, Tex., Dec. 24.—The Christmas Eve production shutdown ordered December 23 by the Texas Railroad Commission revived hope among leaders of the industry that tension and uncertainties may be diminishing.

Other developments of the week inspiring greater confidence include the prospect for an early increase in market demand, which in turn, is alleviating any fears that there will be a general break in crude prices at this time. Extent of the reduction resulting from the added shutdown day will not be determinable until scope of its observance is reflected in production reports for the week ended December 28. Last week, Texas produced 1,343,350 bbl. daily. Complete application of the shutdown would mean a reduction of more than 43,000 bbl. in the December daily average, but this figure must be modified by the exemptions applying automatically where physical waste would result.

Those who had anticipated a reduction in the state's routine allowable following the recent emergency state-wide proration hearing to bring production within the limits of the Bureau of Mines estimates of market demand had been disappointed until the extra shutdown day was ordered. The net result of previous adjustments by the commission has been an increase in the daily average production, despite the fact that the state had been producing about 60,000 bbl. daily above the bureau estimates of market demand.

Reductions in allowables, totaling 2,679 bbl. daily, were ordered for three fields, effective December 20. These fields, East White Point and Plymouth, in San Patricio County, and La Rosa, Refugio County, are in the immediate Corpus Christi area, and have been considered responsible for some of the below-market crudes offered freely in that district. A number of other Corpus Christi fields which have been mentioned frequently as supplying crude above market requirements were not changed. Total allowables of the three fields cut were reduced from 23,692 bbl. to 21,013 bbl.

Direct increases in allowables, effective the same date, were granted 10 fields. These included Bay City and Hamman in Matagorda County; South Esperson, Liberty County; League City, Galveston County; South Houston, Harris County, and Baldwin, Nueces County, all in the Gulf Coast, and Sewell and Rogers, Young County; Fargo, Wilbarger County, and North Cowden, Ector County. The total allowables of these fields were increased 6,106 bbl., from 24,552 bbl. to 30,658 bbl. The net increase for the state, considering the three fields cut, amounted to 3,428 bbl. daily.

Along with these adjustments, the Railroad Commission authorized exemptions from shutdown days for the Angleton field, Brazoria County, for the remainder of December and January and for the old West Columbia field, same county, for the 9 shutdown days which have been ordered for January. Both fields are on the Gulf Coast. The Angleton exemption will increase the daily average production about 122 bbl. while that at West Columbia will aid 579 bbl.

That the state's overall allowable had not been reduced earlier in line with the bureau estimate of market demand as had been anticipated by some, is not entirely a surprise in view of the almost unanimous requests of purchasing companies at the recent emergency proration hearing that allowables not be cut. These requests, which came both from major companies and independents, were accompanied in most instances by assertions that supplies of the respective companies were inadequate for current needs, let alone the necessity for depending on accumulated stocks to secure future operations.

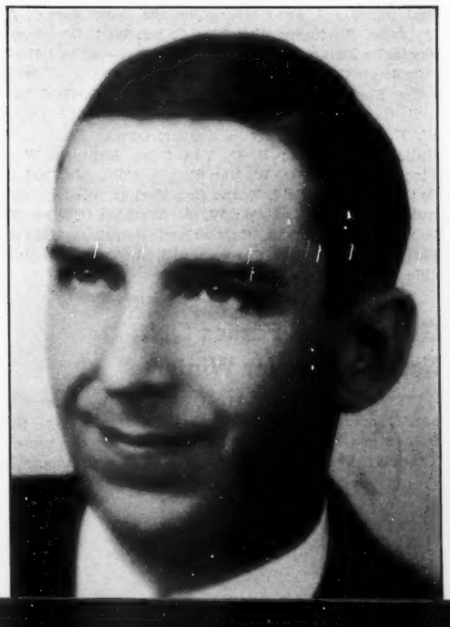
In the minds of many observers, all of this anomaly presented a confusing picture, especially when it is known that substantial volumes of crude still are being freely offered in the open market from various fields at prices below posted

Thompson Made Railroad Commission Chairman

E. O. Thompson once again heads the Railroad Commission of Texas, being elected to that position on Monday by commission members Jerry Sadler and Lon A. Smith. In addition to this change in the commission's chairmanship, the resignation of John E. Taylor as chief supervisor of the Oil and Gas Division was accepted Monday by the body. His duties will be taken over by F. V. L. Patten, present director of production of the Oil and Gas Division, effective January 1, 1941. Colonel Thompson succeeds Mr. Smith, who will retire from the commission on January 1 after serving on the body for 16 years, during which he was chairman three times. Mr. Smith will be succeeded by Commissioner-elect Olin Culberson.

E. O. THOMPSON

F. V. L. PATTEN



JOHN E. TAYLOR

schedules. Only the past week, one of the major companies reported being offered as much as 500,000 bbl. of East Texas crude in one lot from independent sources at a price 9 cents below the market. The offer was turned down not only on the grounds that this company is not interested in buying crude on that basis but also because the company had more than an adequate supply of that type of crude.

On the other hand, it can be said that most of this oil being offered in this way, as in the case of East Texas, is of the lighter, gasoline-producing type. Crudes high in fuel-oil yields generally are in demand with premiums being offered in many instances. It is noted that generally when increased allowables have been asked they are for fields producing the heavier types of oil, or oil that meets some special needs. However, at this time of year, refining companies and other purchasers normally can be expected to take cognizance of the approaching gasoline-consuming season in their demands for crude supplies.

COMPARISON OF GULF AND EAST COAST REFINED-MARKET SPREAD

	Gasoline (72-74 oct. leaded)		Kerosene (41-43 ww)		No. 2 burner oil		Bunker C fuel	
	Sept. 17	Dec. 17	Sept. 17	Dec. 17	Sept. 17	Dec. 17	Sept. 17	Dec. 17
East Coast prices*	5.500	5.50	4.800	5.300	4.100	4.500	2.738	2.738
Gulf Coast prices*	3.875	3.50	3.875	3.625	3.375	3.125	2.024	1.904
Spread (cents per gal.)	1.625	2.00	.925	1.675	.725	1.375	.714	.834
Spread (cents per bbl.)	68.25	84.00	38.85	70.35	30.45	57.75	30.000	35.00
Tanker rate (cents per bbl.)	18.00	70.00	19.00	75.00	20.00	80.00	20.00	65.00

*Cents per gallon. Prices on Bunker C fuel computed from barrel quotations in bulk.

January Outlook

Hopes of the Texas oil industry for an increasing market demand after the first of the year are indicated in the bureau estimates for January, announced last week. According to these estimates, 1,297,500 bbl. of Texas oil will be needed daily during that month. This will be an increase of 20,500 bbl. over the demand estimate for December.

Despite this increase in estimated demand, Texas production, on the basis of the old allowable, would have exceeded the bureau figures for January by about 45,850 bbl. daily. Consequently, the extra shutdown day may about compensate for earlier excesses in December.

Refinery Markets

Meanwhile, no improvement has been indicated in the Gulf Coast refinery markets. Product prices continue at depressed levels, some below actual costs. Spot demand is entirely dormant with only contract material moving to regular outlets.

Attention of refiners on the Gulf is now being directed to the move started the past week by the consumers division of the National Defense Advisory Commission to investigate recent increases in tanker rates on fuel oils.

Marketing problems faced by Gulf refiners as a result of the rapid increase in tanker rates are indicated in an accompanying table comparing spreads existing between gulf and eastern markets for the week of September 17, just before the rise in rates started, and with those at this time.

In the table it can be noted that while the spread between Gulf and East Coast prices on gasoline increased only ⅜ cent per gallon (15.75 cents per barrel) tanker rates jumped 52 cents per barrel between September 17 and December 17. In the same way, the spread in refinery prices of kerosene increased only 31½ cents per barrel as against an increase of 56 cents per barrel in tanker rates. The spread in refined-market price of No. 2 fuel oil increased only 27.30 cents per barrel while tanker rates jumped 60 cents. On Bunker C fuel the price spread advanced only 5 cents with an increase in tanker rates of 45 cents.

In the case of gasolines there still is sufficient spread between the Gulf and East Coast prices, disregarding handling and other charges, to absorb the higher tanker rates, but in the case of kerosene, No. 2 burner oil and Bunker C fuel the spreads are materially less than the tanker rates. It can be observed that in the case of No. 2 burning oil, for instance, the East Coast price still must be advanced the equivalent of 22¼ cents per barrel before the entire tanker-rate increase is absorbed, while Bunker C prices should be at least 30 cents per barrel higher.

Considering present low product quotations at the Gulf, which are already and have been for some time below the costs of posted-price crude, coastal refiners have been reasonably successful in resisting the pressure to cut quotations in order to absorb some of the tanker-rate increase not taken up by eastern-market advances. Gulf refiners are in a position of losing markets to other areas whose transportation costs to the East Coast now may be under the coastwise-tanker charges.

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Kentucky Oil and Gas Association Officers for 1941

OWENSBORO, Ky.—The Kentucky Oil and Gas Association at its meeting this month elected N. W. Shiarella as its president for the coming year and named also the following as officers and directors: Vice presidents, M. A. Arvin, Owensboro, Ky.; M. G. Powers, Huntington, W. Va.; P. C. Van Gilst, Ashland, Ky.; secretary, E. L. McDonald, Lexington, Ky.; assistant secretary and treasurer, Paul D. Bushong, Owensboro, Ky.

Directors elected were: M. A. Arvin, Snowden & McSweeney Co.; Joshua Bailey, Joseph B. Mayer Co.; O. F. Beaty, Magnolia Petroleum Co.; George C. Collins, Collins Oil Co.; H. T. Downing, Onsel Brothers & Downing; E. J. Evans, Evans Oil & Gas Co.; M. W. Fowler, South Penn Oil Co.; A. V. Hoenig, Hoenig Oil Co.; O. H. Horne, Inland Gas Co.; W. E. Hupp, Hupp & Duff; C. Taber Johnston, Mecca Oil Co.; W. H. Keffer, Ashland Oil & Transportation Co.; J. J. McClelland, Ohio Oil Co.; E. L. McDonald, Ashland Oil & Refining Co.; J. Fred Miles, The Petroleum Co.; C. A. Morrison, Producers Pipe Line Co.; J. W. Polkinghorn, Kentucky Natural Gas Corp.; M. G. Powers, Bed Rock Petroleum Co.; E. J. Reading, Sun Oil Co.; E. G. Robinson, Shell Oil Co., Inc.; R. C. Rowan, Warfield Natural Gas Co.; N. W. Shiarella, Miller & Shiarella; W. K. Snyder, Stewart & Snyder; Osman E. Swartz, United Carbon Co.; P. C. Van Gilst, Kentucky-West Virginia Gas Co.; O. W. Van Petten, Columbia Carbon Co.; H. C. Wakefield, Texas Co.; Earl D. Wallace, Petroleum Exploration Co.; W. A. Watkins, Carter Oil Co.; C. J. Weideman, Cumberland Petroleum Co.; J. Frank Wilson, Sohio Corp.; and J. A. Yunker, Louisville Gas & Electric Co.

Geophysical Parties Quit North Dakota for Winter

PIERRE, S. D., Dec. 24.—Field work by surveying parties operating in the South Dakota section of the Dakota gas basin was virtually closed for the season Thursday by the departure of a Carter seismograph party which has been operating in this vicinity since May. Official temperatures on the day of their departure were a maximum of 44 and a minimum for the preceding 24 hours of 30, but earlier in the week some lower temperatures occurred which caused trouble with frozen water lines.

During the preceding week a Carter seismograph party which has been operating around Mandan in North Dakota likewise departed for the South, as did a coring crew which has been drilling stratigraphic tests in the basin the past summer.

Gravity-meter crews believed to be working for Magnolia are reported proceeding but it is believed that members likewise will depart for the South shortly. All magnetometer parties in the area have left.

The intensity of leasing activities has increased recently, with some companies engaging local land men to assist. Six Pierre residents are reported as having been hired for such work during the past week.

The South Dakota Rural Credit Board, probably the largest single landowner in the area, is now reported as virtually "sold out," with more than 600,000 acres under lease in an area 125 miles square. The board still has some remaining unleased acreage in Haakon and Ziebach counties. More than 100,000 acres were leased during the past week.

Gain of 8 Per Cent in Oil Demand Forecast for 1941

WASHINGTON, D. C., Dec. 24.—An increase of 102,000,000 bbl. in the domestic demand for all oils in 1941 was forecast last week by the Bureau of Mines in laying a predicate for the January forecast which anticipated crude requirements next month will be 3,591,000 bbl. daily.

"An increase of 8 per cent in the daily average domestic demand for all oils in 1941, including special defense requirements and stocks," said the bureau, "seems a reasonable and conservative assumption, assuming no drastic changes in international relations. This would amount to an actual increase of about 102,000,000 bbl. for the year. A further loss in exports might reduce this figure to a 6 per cent increase in the total demand for all oils, a gain of about 87,000,000 bbl. in 1941 over 1940."

The daily average supply of domestic crude oil estimated to meet the market demand in January 1941 is 3,591,000 bbl. This is 31,000 bbl. daily higher than the estimated demand for December and 2,700 bbl. higher than the actual demand for January 1940.

Refinery gasoline production of 49,700,000 bbl. in January is provided for in the bureau's estimates. The probable gasoline production next month is distributed among the various refinery districts as follows: East Coast, 6,680,000; Appalachian, 1,850,000; Indiana-Illinois, 10,690,000; Oklahoma, 2,670,000; Kansas-Missouri, 2,800,000; Texas inland, 3,360,000; Texas Gulf Coast, 11,600,000; Louisiana Gulf Coast, 1,280,000; Inland Louisiana-Arkansas, 880,000; Rocky Mountain, 1,320,000 and California, 6,580,000 bbl.

The breakdown considers that 3,520,000 bbl. of natural gasoline will be blended at refineries, approximately 7.1 per cent of the total refinery production. The yield of straightrun and cracked gasoline is estimated at 42.6 per cent. This yield, applied to the production of 46,180,000 bbl., gives crude runs of 108,420,000 bbl. or 3,497,400 bbl. daily during January.

The total demand for 111,320,000 bbl. of crude oil in January, an average of 3,591,000 bbl. daily, is broken down by states, as follows:

State—	Forecast January 1941	Forecast December 1940	Actual January 1940
Texas	1,297,500	1,277,000	1,355,800
California	594,800	593,900	607,000
Oklahoma	439,000	422,600	428,000
Illinois	340,300	363,600	357,900
Louisiana	287,400	280,300	263,900
Kansas	191,000	188,400	147,100
New Mexico	100,000	100,600	99,600
Wyoming	75,900	74,500	63,800
Arkansas	66,100	66,100	66,800
Pennsylvania	48,000	47,900	48,500
Michigan	46,100	47,100	65,600
Indiana	20,000	15,500	8,300
Montana	19,000	19,700	17,700
Mississippi	15,200	13,900	2,600
Kentucky	14,800	13,900	16,600
New York	13,000	12,100	14,700
West Virginia	10,000	9,000	11,000
Ohio	9,000	8,000	8,800
Colorado	3,900	3,900	4,400
Nebraska	2,000	2,000	....
Other	.....	.....	200
Total	3,591,000	3,560,000	3,588,300

1940 Gains in Domestic Oil Usage Outstanding

THE domestic demands and the total demands for crude oil and most of the refinery products in the United States for the year which ends next Tuesday will exceed all previous yearly records. Bureau of Mines reports as summarized in the accompanying table reveal that for the first 10 months, gains in domestic consumption far exceeded the decline in export shipments so that producers and refiners in this country had a record year so far as the demand for their products was concerned.

UNITED STATES SUPPLY AND DEMAND

Ten months, 1940 and 1939. (All figures in thousands of barrels)

Crude Oil

10 months—	Total supply	Total demand	Excess Demand	Excess Pct.	Domestic production	Imports	Indicated domestic demand‡	Exports	Stocks refinable crude Oct. 31‖
1940	1,168,496	1,144,527	*23,969	*2.1	1,134,423	34,073	1,098,806	45,721	263,856
Daily average	3,831	3,753	.....	...	3,719	112	3,603	150	.....
1939	1,065,592	1,110,297	44,705	4.0	1,037,957	27,635	1,048,200	62,097	231,852
Daily average	3,494	3,640	.....	...	3,414	91	3,448	204	.....
Increase, 1940.	102,904	34,230	.....	...	96,466	6,438	50,606	†16,376	32,004
	9.7%	3.1%	.....	...	9.3%	23.3%	4.8%	†26.4%	13.8%

Refinery Products—Motor Fuel

10 months—	Total supply	Total demand	Excess Demand	Excess Pct.	Domestic production	Imports	Domestic demand	Exports	Stocks Oct. 31§
1940	513,041	514,856	1,815	0.4	512,959	82	493,937	20,919	79,907
Daily average	1,682	1,688	.....		1,682	0.3	1,619	69	.....
1939	505,714	503,237	2,477	0.5	505,686	28	464,295	38,942	73,256
Daily average	1,664	1,655	.....	...	1,663	0.1	1,527	128	.....
Increase, 1940.	7,327	11,619	.....	..	7,273	54	29,642	†18,023	6,651
	1.4%	2.3%	.....	...	1.4%	192.9%	6.4%	†46.3%	9.1%

Kerosene

1940	60,692	57,268	*3,424	*6.0	60,557	135	54,200	3,068	11,000
1939	57,057	54,889	*2,168	*4.0	57,057	.....	47,867	7,022	9,967
Increase, 1940.	3,635	2,379	.....	..	3,500	.....	6,333	†3,954	1,033
	6.4%	4.3%	.....	...	6.1%	.....	13.2%	†56.3%	10.4%

Gas Oil and Residual Fuel Oil¶

1940	439,287	430,383	*8,904	*2.1	413,791	25,496	399,618	30,765	143,695
1939	400,466	409,116	8,650	2.1	386,468	13,998	366,161	42,955	140,014
Increase, 1940.	38,821	21,267	.....	...	27,323	11,498	33,457	†12,190	3,681
	9.7%	5.2%	.....	..	7.1%	82.1%	9.1%	†28.4%	2.6%

Gas Oil and Distillate Fuels

1940	154,288	144,256	*10,032	*7.0	151,623	2,665	127,321	16,935	49,037
1939	133,556	135,044	1,488	1.1	133,556	.....	107,138	27,906	40,093
Increase, 1940.	20,732	9,212	.....	...	18,067	.....	20,183	†10,971	8,944
	15.5%	6.8%	.....	...	13.5%	.....	18.8%	†39.3%	22.3%

Residual Fuel Oils

1940	284,999	286,127	1,128	0.4	262,168	22,831	272,297	13,830	94,658
1939	266,910	274,072	7,162	2.6	252,912	13,998	259,023	15,049	99,921
Increase, 1940.	18,089	12,055	.....	...	9,256	8,833	13,274	†1,219	†5,263
	6.8%	4.4%	.....	...	3.7%	63.1%	5.1%	†8.1%	†5.3%

Lubricating Oils

1940	30,879	29,568	*1,311	*4.4	30,879	.....	20,294	9,274	8,464
1939	28,281	29,342	1,061	3.6	28,281	.....	19,961	9,381	6,639
Increase, 1940.	2,598	226	.....	..	2,598	.....	333	†107	1,825
	9.2%	0.8%	.....	...	9.2%	.....	1.7%	†1.2%	27.5%

Petroleum Wax (Thousands of pounds)

1940	502,462	464,283	*38,179	*8.2	425,600	76,862	294,453	169,830	113,827
1939	399,137	447,330	48,193	10.8	367,640	31,497	241,641	205,689	81,147
Increase, 1940.	103,325	16,953	.....	...	57,960	45,365	52,812	†35,859	32,680
	25.9%	3.8%	.....	...	15.8%	144.0%	21.9%	†17.4%	40.3%

*Excess supply. †Decrease. ‡Crude only. §Includes finished and unfinished refinery gasoline and natural gasolines. ¶Gas oil and fuel oil equals gas oil and distillate fuels plus residual. Note: Total supply equals domestic production plus imports. Total demand equals domestic demand plus exports. Data on demand for refined products based on refinery shipments. ‖Does not include 12,353,000 bbl. of heavy oils in California. Comparable figure for October 31, 1939, 14,070,000.

Crude Oil Run to Stills and Total All Oils

10 months—	Total imports§	Total exports§	Total crude to stills	Per cent yield gasoline‡	Natural gasoline production	Total supply all oils*	Total demand all oils*	Stocks all oils Oct. 31*
1940	67,339	113,748	1,079,216	43.1	45,458	1,249,801	1,200,875	573,696
Daily average	221	373	3,538	...	149	4,098	3,937	.....
1939	50,189	162,606	1,027,089	44.8	42,555	1,132,644	1,173,431	526,926
Daily average	165	535	3,379	...	140	3,726	3,860	.....
Increase, 1940	17,150	†48,858	52,127	...	2,903	117,157	27,444	46,770
	34.2%	†30.0%	5.1%	...	6.8%	10.3%	2.3%	8.9%

*Total all oils includes crude and refined products, natural gasoline, and benzol. Stocks October 31, 1940, represented 146 days' supply, which compares to 136 days on the same date in 1939. †Decrease. ‡Does not include natural gasoline blended at refineries. §Includes crude oil and refinery products. In case of imports includes receipts in bond and for domestic use. All data based on Bureau of Mines reports.

With November and December estimated, the indicated total demands for crude oil and products in 1940 compared to 1939 follow:

1940 AND 1939 DEMANDS—BARRELS

Product—	1940	1939
Total all oils	1,450,000,000	1,420,035,000
Exports	132,000,000	188,939,000
Total domestic	1,318,000,000	1,231,076,000
Gasoline	615,000,000	600,147,000
Kerosene	71,700,000	68,744,000
Gas oil and distillate	182,000,000	170,743,000
Residual fuel oils	352,000,000	337,223,000
Lubricants	36,000,000	35,594,000
Wax (lb.)	580,000,000	558,125,000

Without exception the gains in total demands were due to the increased domestic consumption. Reductions in exports brought about by the loss of important European markets due to the war as reported in the Government's report for the 10 months ranged from 1 per cent for lubricating oils to more than 50 per cent for kerosene. The most important reduction applied to gasoline, with decreases in sales to foreign buyers in 1940 totaling approximately 22,000,000 bbl.

The war which brought reductions in exports from this country was also largely responsible for a 20,000,000-bbl. increase in imports. Certain South American fields, including refineries located in the Netherlands West Indies, look to Europe for outlets for a large part of their output. When these markets were partially or wholly cut off by war developments sellers were forced to look for other markets and increased shipments of crude oil and the heavier oils into the United States have resulted.

While the 1940 gains in domestic consumption of products classed as gas oil and distillate were not as large as those of 1939 over 1938, there were substantial increases in all of these markets. The principal gains were in products used as furnace oils and diesel fuels. The widening markets for the refinery cuts, classified as kerosene, are revealed in the data which show that the 1940 increase in domestic consumption of this product was one of the largest yearly gains in the history of the petroleum industry.

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George W. Myers Heads Michigan Oil Association

SAGINAW, Mich., Dec. 23.—George W. Myers of Toledo, Ohio, geologist and Michigan manager for Sun Oil Co. is the new president of the Oil and Gas Association of Michigan. He was elected at the Saginaw Club here December 19 at a meeting of the association's board of directors, to succeed Harold M. McClure of Alma.

Other officers are: vice president, Kurt DeCousser of East Lansing, geologist for Socony-Vacuum Oil Co., Inc.; co-treasurers, George B. Talbot of the Talbot Oil Co. and American Drilling Co., and Winthrop P. Clarke of Gulf Refining Co. Walter B. Pardoe, Dapar Oil Co. of Grand Rapids, is the new secretary, succeeding A. J. Weideman of Mount Pleasant.

The directors approved a recommendation to the state Conservation Department that lease terms on state lands be amended to provide that they remain in force so long as drilling operations continue.

GEORGE W. MEYERS

STATE CAPITALS...

OKLAHOMA

THE CORPORATION COMMISSION is expected to issue an order this week setting regulations for determining potentials of two groups of prorated fields in Oklahoma. The order is the result of a hearing held in Oklahoma City last Friday at which the potentials, to become effective January 1, were approved.

The I.T.I.O. and Foster Petroleum Co., owners of all wells in the Frederick (Arbuckle) and Frederick (Canyon) pools of Tillman County, were granted permission to take open-flow potentials in lieu of declines. In Carr City pool, it was recommended there be no change in the potentials because recent tests showed the wells have shown increases after working over and reconditioning. In the Oklahoma City Wilcox zone it was agreed to take a 1 per cent per month decline as in the past. Operators have option of open-flow tests if desired.

In the Class B group, decline of 1.5 per cent per month was recommended for the Allen, Earlsboro pools, Fish, Grayson, Hazel, Konawa, South Konawa, Little River, East Little River, Maud, Mission, Olympic, Sacred Heart, Sasakwa, Sasakwa townsite, Searight, North Searight, Seminole City, East Seminole, Seminole proper and others, and St. Louis pools. Three per cent monthly declines were recommended for Edmond, Jesse, Keokuk Falls, Shawnee, and Lucien pools. Two per cent decline was recommended for the North Bethel pool, while a 6 per cent decline was suggested for the Moore pool.

CALIFORNIA

POINTING OUT THAT A SMALL GROUP of companies, including the so-called majors, was not complying with curtailment to the maximum degree and thereby are endangering the whole voluntary oil-curtailment program in California, A. H. Bell of Continental Oil Co., chairman of the Conservation Committee of California Oil Producers, at the regular monthly committee meeting December 19 warned committee members that he would not continue to serve as chairman of the committee unless greater cooperation in curtailment was shown by the larger units of the industry. Mr. Bell said that he thought it was futile for the committee to discuss inconsequential matters while it apparently was powerless to solve the fundamental problem of conservation of oil.

The committee recommended a January oil production quota of 571,000 bbl. per day, which makes the fifth consecutive month without change in the overall figure. Individual wells, however, will be reduced, due to completion of new wells, the top maximum allotment for any one well for January being set at 148 bbl. per day which is 1 bbl. less than during December. New and recompleted wells expected to be producing by the first of January will require an estimated allotment of 10,011 bbl. per day, offset by a 5,500-bbl. loss through natural decline of producing wells and through abandonments, leaving a net addition of 4,511 bbl. to accommodate through changes in the proration formula. Of this total, the reduction of 1 bbl. in top allotment, affecting 938 wells, will account for 938 bbl. daily, and an additional 2,814 bbl. will be curtailed from intermediate wells through a reduction in the power factor used in the proration formula. The shortage of 759 bbl. per day in curtailment will be added to the allotment, bringing it to 570,763 bbl. daily, which is within the 571,000 bbl. daily recommended quota. The committee, in determining the breakdown of additional curtailment for January pointed out that the 2,814 bbl. cut in allowable for intermediate weeks compensates for last month's action, when the entire reduction was applied against top wells and the intermediate group was not curtailed.

MICHIGAN

A CHANGE IN REGULATIONS governing proration to make limits applicable on a per-well basis, instead of a per lease, has been recommended by the state Oil Advisory Board. P. J. Hoffmaster, board chairman, said new regulations originally had been planned to go in effect with first proration orders, adding that at this time the board does not have sufficient data on new Michigan wells nor ample personnel to handle that type of proration system.

It was explained that the per-lease method might impose a 100-bbl. allowable on a lease on which oil was produced from a 500-bbl. well, a 700-bbl. and a 50-bbl. well. The present system permits the operator to credit surplus from one well to one not able to make its allowable, which would not be permitted under the proposed change. Mr. Hoffmaster said the proposal would be the subject of a public hearing early in January, but indicated he would accept the plan unless strenuous objection developed.

A. H. BELL, chairman of the Conservation Committee of California Oil Producers, has warned committee members that he would not continue to serve in that position unless greater cooperation in curtailment was shown by the larger California companies. Mr. Bell, general superintendent for Continental Oil Co. in California, assumed the duties of committee chairman last July, serving without remuneration. He is now in his twenty-sixth year of continuous service in the oil industry, having worked in the Mid-Continent fields, in Mexico, and for the past 14 years in California. He has been continuously engaged in curtailment and has been a member of all the various California proration groups. (Additional information on the California curtailment picture is given on this page)

ARKANSAS

THE ARKANSAS OIL AND GAS COMMISSION has announced that allowables from controlled fields in the state will be continued at the present rate for the next 90 days. The announcement followed a statewide hearing at which operators were unanimous in opposing a cut. Daily average production will continue at the total of 70,652 bbl., including both flush and settled production. Production in prorated fields will be 45,752 bbl. daily and 24,900 bbl. in settled fields.

The commission removed the Fouke (south Miller County) field from the prorated list and increased the daily gas allowable from 2,000,000 to 3,000,000 cu. ft. a day in the Big Creek area of Columbia County. The daily field allowables (in barrels) follow: Atlanta, 2,490; Buckner, 2,340; Dorcheat, 1,440; Magnolia, 19,787; McKamie, 400; Nick Springs, 1,150; Shuler (Jones sand), 13,607; Shuler (Reynolds lime), 2,516; Urbana, 800; Village, 1,222.

TEXAS

POLLUTION SUITS AGAINST 22 EAST TEXAS operators will be sought by the state about February 8 for allegedly violating an agreement to refrain from dumping salt water from East Texas wells into the Neches-Angelina river system. This announcement was made by Asst. Atty. Gen. Hugh Q. Buck on Saturday, but the 22 companies to be prosecuted were not named. He stated his department has evidence that the companies are directly violating an agreement to stop dumping, and that the department will ask for a motion for continuance against them be set aside and the case tried on its merits.

Hearing on a motion for contempt against Alex McCutchin and John F. Merrick, oil operators alleged to have violated an injunction issued by Judge John R. Rawlins, was postponed indefinitely Saturday because neither of the defendants had been properly served in the case. Judge Rawlins signed an order authorizing Texas Rangers and state highway patrolmen to serve the defendants.

THE NUMBER OF SHUTDOWN DAYS for Texas oil fields during December was raised to 10 on Monday when the Railroad Commission ordered that all fields, except those exempt from production holidays, be closed on December 24. The original December order provided for shutdowns on December 1, 7, 8, 14, 15, 21, 22, 25, and 31. The additional closing day was estimated by commission engineers to hold Texas' production about 15,000 bbl. under the bureau's demand forecast of 1,277,000 bbl. daily for December.

Commission engineers on Monday stated Texas' average allowable last week was 1,367,918 bbl. or 90,910 bbl. over the bureau's recommended production. Underproduction of allowables, however, was expected to lower the overage to 43,041 bbl. over the bureau's figure.

Also the commission has announced that the order exempting the Panhandle fields from shutdowns would be voided. The field has been exempted from all shutdown days this month, and was to be exempted during January.

LOUISIANA

LOUISIANA'S DAILY ALLOWABLE FOR JANUARY was set at 292,756 bbl. by the Department of Conservation on Monday, an increase of 5,508 bbl. over the state's permissible production in December and 5,356 bbl. above the Bureau of Mines estimated market-demand figure. The order raised North Louisiana fields 1,430 bbl. daily to 67,181 bbl., and coastal Louisiana fields were increased 4,078 bbl. to 225,575 bbl. daily. The January daily allowable represents an increase of 18,556 bbl. over the state's allowable production of October of this year.

the OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

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Tale of Two Hemispheres

A year-end survey of oil developments everywhere to which this International Number is devoted naturally divides itself into two parts.

To the east is the hemisphere with 70 per cent of the world's land area and 85 per cent of its population. Over the past year its peoples have either been at war or dominated by conditions brought about by wars.

They have consumed less petroleum extending from the inhabitant of interior China who only recently advanced to the kerosene-light era, to the affluent Briton who feels it is unpatriotic to operate his cars.

Axis-invaded countries have had their petroleum supplies reduced to a small fraction of their requirements and their populations are rapidly going back to the transportation and power facilities of previous generations. Adjoining neutrals are conserving their supplies.

Nations at war are not using the petroleum they were supposed to. The figures presented 16 months ago as to the petroleum needs of an army on the march were impressive. But it has been demonstrated that motorized armies can go a long way in a short time and after they accomplish their objective, the land machinery is idle.

Rationing of civilian petroleum consumption to offset increased military needs has been effective. Some of the belligerents' reports indicate that their total consumption of certain petroleum products is now less than it was previous to September 1939.

Navies which are free to roam the seas have consumed more petroleum but, since June, important units of the world's naval power have been destroyed or are inactive. Restrictions placed on merchant marine have tended to curtail petroleum consumption in commerce.

Oil consumption in the air has increased many times over any previous war but as regards volume the petroleum requirements of aircraft have been and will continue to be of minor importance.

Thus the war has blotted out important oil markets, destroying far more than it has created.

The situation in oil supply is much the same. In a section of the world where needs far exceed output, oil properties have been destroyed, sabotage has brought permanent damage and efficiency has been reduced because equipment and supplies for the fields and refineries have been inadequate and personnel less competent.

The view on the western side of the world is much brighter. Though small in area and population the petroleum consumption of the Western Hemisphere has expanded to more than offset the Old World's contraction.

This hemisphere, which is outside the active combat area, has been able to continue those peaceful activities which starting with the turn of the century have accounted for the rapid growth of the petroleum industry.

The Latin American countries whose frontiers and local industries have been opened by petroleum power have increased their oil consumption in every direction. If they keep peace among themselves and no outside nation interferes with the development of their economies now under way, their petroleum supplies and needs will expand by leaps and bounds.

But what has happened in this country is by far the most interesting exhibit of the year. Gasoline had one of the largest yearly increases with a still larger gain in prospect for the coming year.

Petroleum consumption in this country is not confined to the streets and highways and this year uses on farms and in factories, in furnaces and stoves, in diesel engines, in all types of rail and water transportation and in hundreds of specialties, established new records.

The result was that 7 per cent of the world's population consumed nearly two-thirds of its petroleum. All this is internationally important because it indicates the possibilities elsewhere when peace returns.

Refinery Expansion

Phillips Builds Byproduct Butadiene Plant at Borger

Phillips Petroleum Co. is now building a byproduct butadiene plant at Borger, Tex. This latest Phillips project will be the first butadiene plant in the Mid-Continent and Texas areas and will begin operation early in 1941.

The plant will recover byproduct butadiene now produced incidentally in the manufacture of neohexane. The butadiene so made is present in low concentration in a gas stream and its recovery and purification is a difficult operation and a substantial technical accomplishment. The butadiene so made will be used in the manufacture of synthetic rubber by Hydrocarbon Chemical & Rubber Co.

Hydrocarbon Chemical & Rubber Co., of Akron, Ohio, has merged the synthetic-rubber interests of the B. F. Goodrich Co. and Phillips Petroleum Co. Ross W. Thomas of the Philgas Division of Phillips is president of the new concern which will manufacture and sell synthetic rubbers, and Dr. Waldo L. Semon of Goodrich, one of America's outstanding research scientists, is vice president and director of research.

Texas Co. Employes at Port Neches To Hold Secret-Ballot Election

WASHINGTON, D. C.—The National Labor Relations Board has announced that a secret-ballot election will be conducted within 30 days among the employes at the Port Neches refinery of Texas Co., Port Neches, Tex., to determine whether or not they desire to be represented by Oil Workers International Union, Local No. 228 (C. I. O.), for the purposes of collective bargaining. The question concerning representation arose in July 1940 when the company denied the union's request for exclusive recognition.

Westville Refinery Files Answer To Misrepresentation Complaint

WASHINGTON, D. C.—Westville Refinery, Inc., Westville, Ind., has filed an answer to the complaint recently issued by the Federal Trade Commission which charged it with misrepresenting that it was a refinery, that its oil was Pennsylvania oil with a paraffin base, and that its reclaimed oil was virgin crude oil. The answer denies that the term "refinery" is properly applied only to an establishment where virgin crude oil is refined and processed for use, denies that the term is understood only in this sense by the petroleum industry and the purchasing public and states that many establishments which reclaim oil, as does the respondent, are known both to the industry and to the public as refineries.

The answer also denies that the use of the brand name "Para-Penn" constitutes a representation that the oil so designated is from Pennsylvania oil fields or has a paraffin base, although respondent contends the oil so branded is in fact a paraffin-base oil and is in fact similar to and closely related to Pennsylvania oil. The answer also alleges that respondent's superlube oil has a 100 per cent pure Pennsylvania base, and is refined from 100 per cent pure Pennsylvania and other high-grade paraffin-base motor oils and paraffin-base stocks.

Natural Gasoline

Geier and Jackson to Construct Recycling Plant at Grapeland

DALLAS, Tex.—Construction of a 55,000,000-cu. ft. gas-recycling plant in the Grapeland area of East Texas will be started soon by Geier Bros., Inc., and F. B. Jackson of Dallas. Contract for the work has been let to Hudson Engineering Co. of Houston, Tex., with completion scheduled for the middle of April 1941. The partnership will drill from 6 to 10 wells to gas-condensate production at about 6,000 ft., from which the gas will be recycled. It has holdings of about 3,000 acres in the field, with one gas-condensate producer. John L. Hill, formerly with Continental Oil Co., is chief engineer of the firm. The plant will be the fourth plant for the field, all of which have been completed in only a little over a year.

Del Valle Building Gasoline Plant Near Castaic, Calif.

LOS ANGELES, Calif.—Erection of a natural-gasoline plant for Del Valle Gasoline Co. on its lease located 3 miles west of Castaic, Calif., is now under way according to the joint announcement of R. E. Havenstrite and R. E. Bering of that company. Parkhill-Wade, Los Angeles consulting and construction engineers, are in charge of operations. The plant is designed to handle a maximum of 20,000,000 cu. ft. of natural gas per day at 450 lb. with a lean-oil circulating rate of 125 gal. per minute. Daily distribution and stabilization capacity of the plant is 15,000 gal. of 26-lb. Reid finished gasoline.

Conventional in design, the plant will include a vapor-recovery system while its features will be compact plant layout, automatic plant control, audible alarm signals and a patented Parkhill-Wade stabilizer cycle. The main compressors and vapor-recovery system will, in effect, make this a three-stage plant. Incoming gas from the field trap will pass through a scrubber and into the first compressor stage at 25-lb. suction, go through the cooling tower, a second scrubber and through the second compressor stage where the pressure will be increased to 450 lb. per sq. in. After passing through an orifice meter, the wet gas will then enter the absorber.

The entire plant will be automatic in operation after manual setting of the lean-oil circulation rate. This will be accomplished by liquid-level controls.

Anchor to Construct Gasoline Plant in Bunkie-Eola Field

SHREVEPORT, La.—Anchor Gasoline Corp. of Eola, La., will construct a 30,000-gal. natural-gasoline plant in the Bunkie-Eola field. Gas produced in the fields at the present time is not being utilized for natural-gasoline manufacture. Part of the equipment going into the Anchor plant is being moved from Mockley Petroleum Co.'s plant at Fry, in Brown County, Texas, which was shut down December 1. Also some 50 miles of gathering line is being moved from Fry field. M. E. Mockley, president of the Mockley company, is a large stockholder in the Anchor company.

Natural Gas

Reserve Pipe Line Hearing May Be Held in January

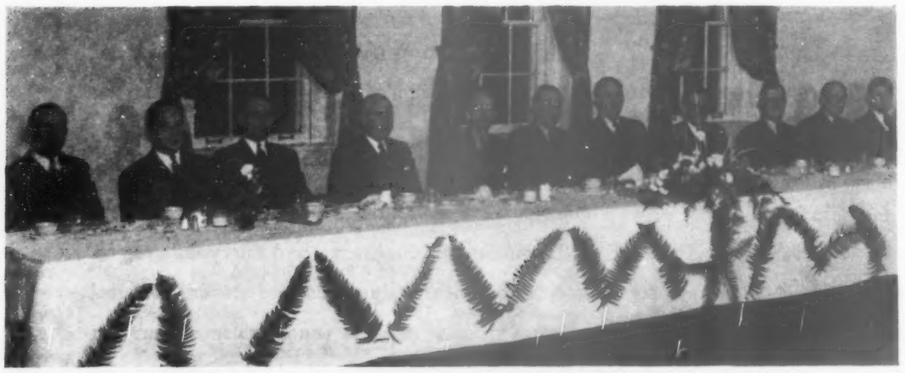
WASHINGTON, D. C.—Although no definite date has yet been announced, officials disclosed last week that the Federal Power Commission hearing on the Reserve Gas Pipe Line Co. application for a natural-gas line from Texas to New York City will probably be set for the end of January.

The company this summer asked the commission for a certificate of public convenience and necessity to build a line extending from the Texas Gulf Coast fields through 10 states into New York. Cost of the project was estimated at $80,000,000. Plans call for the construction of a 24-in. main transmission line, two 10,000-hp. stations on the south end of the line, and 11 stations of 9,000 hp. each. No amendments to its application have been filed by the Reserve company, so the probability is that it contemplates no changes in its original plans.

The importance of this project, which will tap the richest remaining natural-gas market in the country, has aroused conjecture that the hearing might take place before the entire Federal Power Commission. Usually a trial examiner takes testimony on applications, and recommendations are then submitted to the commissioners. Officials agreed that the hearing will in all likelihood be held in Washington, but if unusual circumstances arise, it might take place in some other city, most likely in Texas.

The usual petitions for intervention have been filed by coal and railway management and labor groups. The commission has not announced any action on the petitions. Petitioners include the Railway Labor Executives Association, the National Coal Association, and the Association of American Railroads, all nation-wide organizations, and the Central Pennsylvania Coal Producers Association, the Anthracite Institute, and the Davis Coal & Coke Co., with most of their markets in the New York area.

ANDERSON-PRICHARD AWARDS EMBLEMS TO 40 EMPLOYES



Forty employes of the Anderson-Prichard Oil Corp. this week are still admiring their pre-Christmas gifts consisting of gold service buttons received December 18 at a banquet in the Twin Hills Golf and Country Club, Oklahoma City, Okla. J. Steve Anderson, vice president, declared the presentation of service buttons to employes with 10 years or more service would become an annual custom. This year a total of 137 employes out of 477 now engaged by the company will receive awards.

Officers and department heads of Anderson-Prichard Oil Corp. as seen at the Oklahoma City banquet are: G. H. Burruss, D. R. Grable, Weston Payne, W. M. Sturges, T. H. Marshall, J. Steve Anderson, L. H. Prichard, C. H. Dresser, P. H. Anderson, C. L. Mayhall, and R. Brauchli.

News of Pipe-Line Activity, which was formerly found on this page, will be found on Page 285.

President Seeks Early Passage of Cole Bill

By HENRY D. RALPH

WASHINGTON, D. C., Dec. 23.—The Cole bill for federal regulation of petroleum production will be reintroduced in the next Congress and hearings on it will probably be resumed in January.

This was announced by Rep. William P. Cole, Jr., of Maryland, author of the bill and chairman of a subcommittee of the House committee on interstate and foreign commerce, following his action in postponing hearings originally scheduled for last week. At the same time he made public a letter received from President Roosevelt which led to the scheduling of the hearings at which spokesmen for the National Defense Advisory Commission were to have appeared.

In this letter the president described an "urgent need" to prevent the waste of oil, and asked the committee to make "appropriate recommendations" in the near future. He also referred to his letter of last spring in which he suggested modification of the Cole bill to accept state conservation programs if in conformity with federal standards It is reported that Interior Department experts are assisting Representative Cole in drafting a revised bill containing these suggestions.

In his letter, President Roosevelt said:

"Last spring I wrote a letter to you in which I discussed the desirability of petroleum-conservation legislation. I expressed several ideas that I hoped would be helpful to your committee in meeting the objection that had been voiced as to the proposed legislation which you have before you for consideration.

"The vital need for petroleum in national defense, its importance in commerce and industry, and the critical condition of Europe and Asia, confirm my belief in the urgent need of federal legislation to safeguard our petroleum supply through prevention of waste and by establishment and maintenance of sound economic conditions in the oil industry. I am sure that your committee has given this important matter careful consideration and I am hopeful that a satisfactory solution with appropriate recommendations will be reported in the near future."

In his letter of last spring to which the president referred, he said:

"I should think it would be possible to agree that the standards should be enforced by the federal Government only if an authorized federal agency finds that the states have failed to enact laws requiring conformity with federally prescribed standards or have failed persistently to enforce compliance with such standards when required by state laws."

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DEATHS

JOSEPH GOSLING, 66, pioneer developer of the Signal Hill field of California, died Sunday, December 15, in Los Angeles, Calif. A native of Wisconsin, he came to California after the first World War and was one of the organizers of a company which drilled one of the first wells in Signal Hill. Later he joined the leasing department of Signal Gasoline Co. He is survived by the widow and a son.

W. L. LAFFOON, 40, employed by Carter Oil Co. in Illinois for more than 20 years, died December 21 at his home in Altamount, Ill., of a cerebral hemorrhage. A member of Carter's 20-Year Club, he worked in Seminole and Tulsa before being transferred to Altamount 3 years ago. Survivors include his widow and a son and daughter.

STUART A. GIRAUD, 53, director and vice president of Humble Oil & Refining Co., died December 22 in Houston, Tex., following an illness of 3 weeks. Mr. Giraud was chairman of the manufacturing and marketing committees. Before joining Humble in 1915 he had been associated with Rio Bravo Oil Co. and Gulf Refining Co. He had served on the Humble board since 1938.

W. E. PIPHER, 72, oil-well contractor and producer for the past 40 years, died at his home in Parker, Pa., December 15. He leaves a son, a daughter and a brother.

HUGH McCREA, former Oil City, Pa., resident, associated for a number of years with Trinidad Leaseholds, Ltd., died December 17 at the Mayo Clinic at Rochester, Minn. Reared in Oil City, he was first employed in the office of the Oil Well Supply Co. He was later employed for 5 years by the Trinidad Lake Petroleum Co. and for the past 20 years has been associated with Trinidad Leaseholds, Ltd. He is survived by his widow and one son.

CHAUNCEY BRINK, 75, of Aiken, Pa., employe of the Grant & Mohan Oil Co. for the past 32 years, died at the Fairview Hospital at Degolia, Pa., on December 15. He suffered a paralytic stroke on December 1. He leaves his widow and a son

THOMAS M. DAUGHERTY, 82, retired employe of the United Natural Gas Co., died at the home of his son in Franklin, Pa., December 16. He has been employed by the gas company in Sharon and made his home in Franklin for the last 10 years.

ALVA BARBER, 60, general superintendent in the Mid-Continent for Illinois Pipe Line Co., died December 19 in a hospital in Terre Haute, Ind. Born near Oil City, Pa., he was employed there by the National Transit Co. He was located later for a time at Lima, Ohio, and Martinsville, Ill. In 1914 he was made assistant superintendent of Illinois' trunk lines between Wood River Ill., and Bluffton, Ind.; and in 1926, superintendent. In 1938 he was appointed general superintendent and in the following year was elected to the board of directors. He is survived by a son, three sisters and a brother.

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Sinclair Believes Oil Stocks Are Below Convenient Level

NEW YORK, Dec. 24.—Concern over the stock position of the oil industry expressed here last week by Harry F. Sinclair, chairman of Consolidated Oil Corp., had drawn no rejoinder in official statements but many executives have taken issue in informal discussions. "As to inventories of crude oil and finished stock," said Mr. Sinclair, "I do not share the opinion which has been expressed over a long period of time that these inventories are excessive. We are using about 3,000,000 bbl. of crude oil a day east of the Rocky Mountains. Crude oil in storage in this area at this time approximates a total of 227,000,000 bbl. or about 75 days' supply. It is a mistake to think of this raw material as being piled up somewhere and about to engulf us. Many millions of barrels are not really available at all. If the industry is to continue to function, the pipe lines must always be full; hundreds of refineries must have working stocks on hand; millions of barrels must always be in transit on the water. So we really haven't 75 days' supply—probably less than half of that.

"I feel even more strongly about gasoline stocks. Anxiety is expressed because we have a few million barrels more than someone estimated several years ago was the ideal figure. We should have more because consumption is greater. I know of no excessive stocks in any area. It seems to me that, less than 2 months' supply of gasoline is very little for an industry as vital as ours to all industry, to defense and to the necessities and well-being of the whole country."

THE MARKETS*

CRUDE OIL: The extra shutdown day ordered in Texas this week had a strong psychological effect on the crude-oil market of the Southwest where temerity has existed for weeks among producers. Pennsylvania purchasers are now uniform in paying higher prices based on $2.15 for Bradford grade crude. Middle West prices are strong.

REFINERY: Residual and light-fuel prices softened slightly among some Gulf Coast suppliers. Oklahoma producers advanced natural-gasoline prices an eighth of a cent. Lubricating-oil prices in Pennsylvania are moving higher as a result of the domestic pickup and advanced crude costs.

TANK WAGON AND POSTED DEALER: Prices in the eastern market are undergoing routine adjustments with the trend upward in compensation for the higher transportation costs. Kerosene and distillate fuels advanced in Maryland and at other scattered points along the eastern coast.

FINANCIAL: Prices of oil securities softened this week. Average of 30 representative stocks for the week ended December 21: High, 23.57; low, 22.59; close, 22.94. Week ended December 14: High, 23.77; low, 22.68; close, 22.94.

*Detailed information in Market Section.

NEXT YOU TURN TO THE INTERNATIONAL SECTION

Caisson-Type Mar in Support Derricks in

Fig. 1 (above)—Pile-casting yard, La Salina. Crane handles sand and rock into stock piles and from stock piles into hopper above concrete mixer. Locomotive hauls cars carrying concrete buckets from mixer to casting beds. Fig. 2 (right)—Overhead crane in casting yard handling a finished 95-ft. section. Fig. 3 (below)—Finished piles are transported to the location on barges. Here the crane is picking up a 140-ft. section, weighing 82 tons

By J. P. O'DONNELL

THE progressive development of Lago Petroleum Corp.'s concession in the District of Bolivar, Venezuela, all of which is covered by the waters of Lake Maracaibo, is accompanied by new problems of increasingly difficult and expensive solution. The problem of supporting derrick foundations 8 miles from shore in more than 170 ft. of water and semiliquid mud is an outstanding example. The following description and the accompanying photographs of the novel caisson-type marine foundation developed expressly for this purpose make it evident that both the present and future development of the Lake Maracaibo concession can be accomplished only at great expense by an organization with large financial resources.

The increasing depth of the water as development proceeds farther from shore constitutes a difficult problem in itself and one that is complicated by the extreme variations in soil conditions resulting from the sedimentary character of the area. The lake bottom may vary from a hard, dense clay to 100 ft. of the semifluid mud, and local variations have been encountered which result in a difference of 10 ft. in the lengths of piles at adjacent corners of a derrick foundation.

The use of wood piles for marine foundations is impractical because of insufficient lengths and because of the presence of teredos, commonly known as shipworms, which thoroughly perforate submerged timber. The highly corrosive waters of the lake make the use of unprotected steel impractical also. This problem was solved by the adoption of solid reinforced concrete piles which have been used successfully in comparatively shallow water. These piles vary in length from 30 ft. to 135 ft. and in diameter from 16 in. to 24 in., depending on depth of the water at the location.

In these foundations three piles are set at the corners, i.e., two vertical piles and a single batter pile. A steel encasement was placed on top of the piles and set in concrete at the four corners to form a 26-ft. square foundation upon which the derrick is built. However, the maximum safe length of the 24-in. square, precast concrete piles is 135 ft. so that a different type was needed for deeper locations. To meet these conditions the caisson or tubular-type pile was developed by Lago engineers. The first of these was used in late 1938 and its success, coupled with a number of improvements in later installations, led to the adoption of the caisson pile as the "next step" in the development of the Lake Maracaibo concession. What will follow as development progresses into deeper water is a problem of the future for Lago engineers.

The caisson-type pile is a circular column of

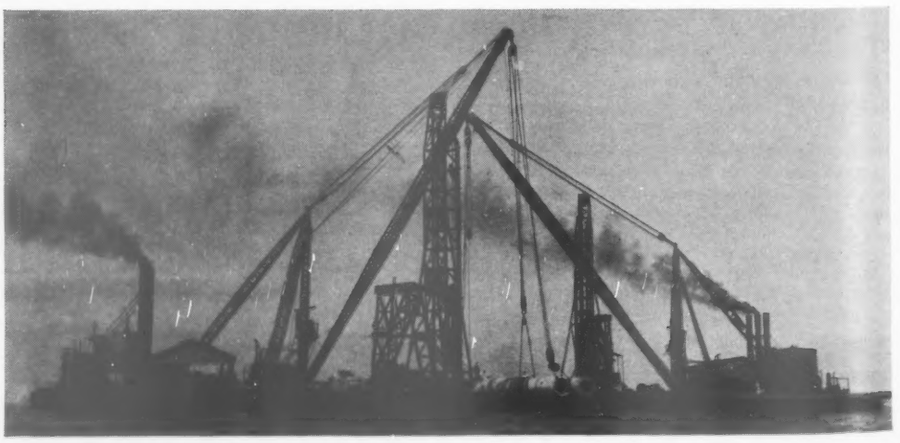


Fig. 4—At well location the pile is lifted from barges by two 50-ton capacity cranes. Barges are equipped with pile drivers used for setting the solid concrete piles

ine Foundations in Lake Maracaibo

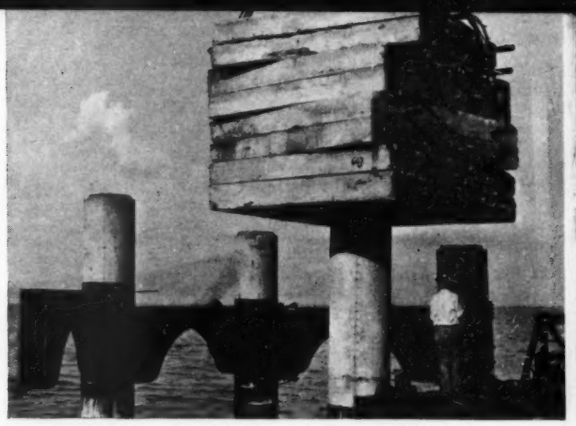


Fig. 6—Showing dead-load method of driving piles. Precast concrete weights are placed on piles by floating cranes

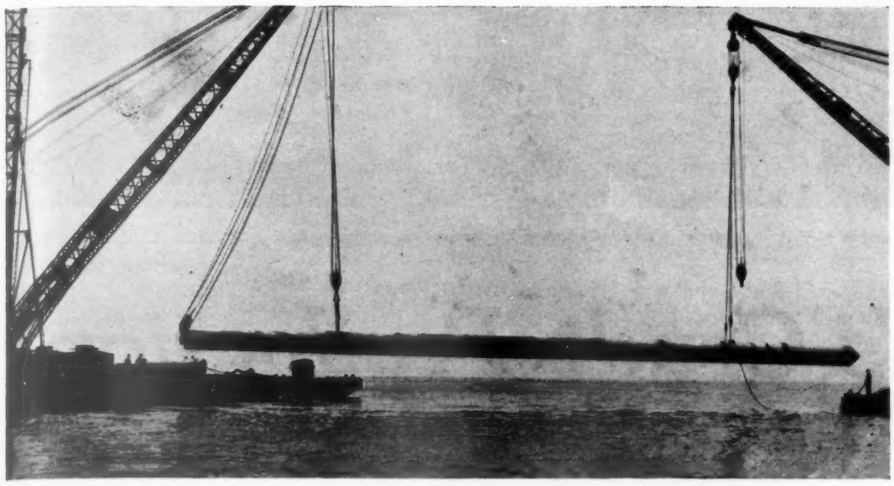


Fig. 5—A caisson suspended between the two barges is shown here. The pointed end, at right in picture, is lowered until the crane holding that end can cast loose

thin steel plates encased in concrete. The concrete and steel wall of the pile is 5 in. thick. The steel plates are obtained as semicylinders which are welded together to form a cylinder 15 ft. in length. This cylinder is placed inside a larger one which constitutes the form, and concrete, with spiral reinforcement, is poured in the annular space. This is done in a vertical position and the form is vibrated externally during the pouring to simplify and insure concrete placement. After the outer form is removed, the concrete is cured. Then the 15-ft. cylinders are joined by circumferential welds and the welded joints grouted to form a pile of the desired length. The lower end of the pile which penetrates the mud and rests in the clay is closed with a heavy concrete point 5 ft. in length. The usual diameter of the piles is 5 ft.

Views of the plant at which the piles are manufactured are shown in Figs. 1 and 2. Fig. 1 shows a section of the pile-casting yard at La Salina with the concrete mixer, the crane and piles of sand and gravel. The cement is handled in bulk. The crane supplies the stock pile from barges and also feeds the hopper above the concrete mixer.

The locomotive hauls the cars carrying the concrete buckets from the mixer to the casting bed. Fig. 2 shows the overhead crane in the casting yard handling a finished 95-ft. section.

The finished piles are transported to the location on barges, one of which is shown in Fig. 3. This barge is transporting two 150-ft. piles and two extra sections if they are required. At the well location, the pile is lifted from the barge by two 50-ton-capacity cranes as shown in Fig. 4. The barges on which the cranes are mounted are also equipped with pile drivers used for setting the solid-concrete piles.

A caisson suspended between the two barges is shown in Fig. 5. The pointed end, at the right in this picture, is lowered until the crane holding that end can cast loose. The other crane then lifts the upper end of the caisson until the pile

(Continued on Page 162)

Fig. 7 (below)—Sections being added to two piles while a third is being driven

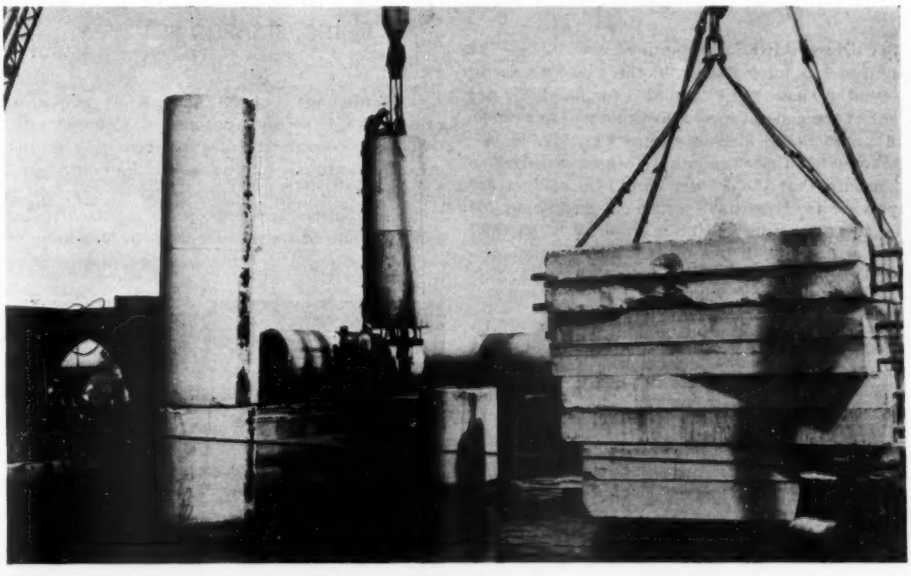
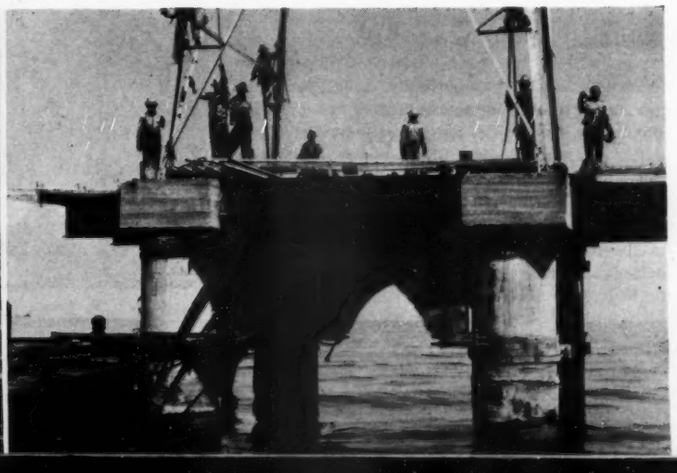
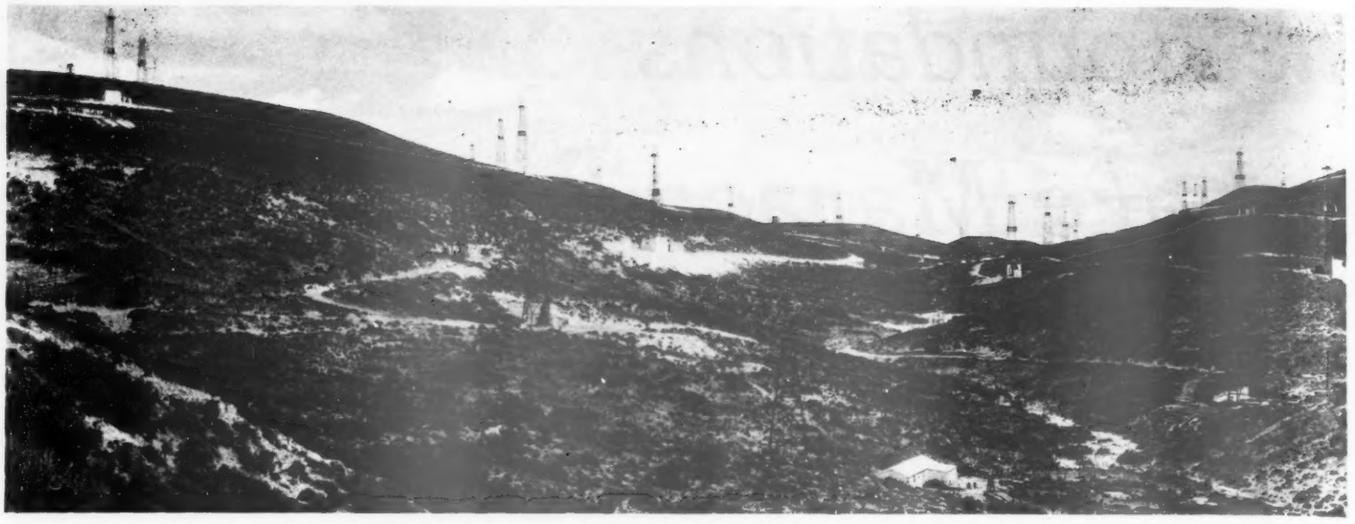


Fig. 8 (left, below)—Foundations are completed by cutting piles to grade and sealing with concrete cap. The steel base which supports the derrick and drilling equipment is set in concrete caps. Fig. 9 (below, right)—Preliminary work in erection of derrick





The Canadon Perdido section of Y. P. F. operations in the Comodoro Rivadavia field of Argentina

Argentina's Crude Production Up 10 Per Cent in 1940

By ING. RICARDO SILVEYRA
President, Yacimientos Petroliferos Fiscales

BUENOS AIRES, Argentina, Dec. 24. — The Province of Mendoza, in the western part of Argentina, has singly accounted for nearly 90 per cent of the general increase in this nation's crude-oil production which amounted to 1,479,745 bbl. through the first 9 months of the year. Indications are that the 10 per cent rate of increase applying to Argentina's crude-oil production for the first 9 months will be maintained when final 1940 data are available. Based on the actual production of 18,614,660 bbl. for 1939 the yield this year will be 20,476,130 bbl.

As was predicted in a similar review of Argentine oil operations in the International Issue of The Oil and Gas Journal a year ago, 1939 ended with a material increase in crude production over previous years. The final national production for 1939 of 18,614,660 bbl. was an increase of 1,537,065 bbl., or 9 per cent.

Of the total 1939 production, Yacimientos Petroliferos Fiscales, the government company, accounted for 10,223,360 bbl., and the private companies had aggregate yield of 8,391,300 bbl. The increase in the national company's production was 13.6 per cent while private companies gained 3.9 per cent.

To the increase of 1,537,065 bbl. in 1939 national production, the Comodoro Rivadavia area contributed 678,910 bbl. (44.1 per cent); the Province of Mendoza gained 613,015 bbl. (39.8 per cent) and Plaza Huincul increased 312,290 bbl. (20.3 per cent). The Province of Salta, in the northern part of the country, declined 67,075 bbl.

The Comodoro Rivadavia area, the oldest under exploitation in the country, has maintained its leadership of all producing sections but this has been possible only by intensive and skilled maintenance and application of modern extraction methods.

There have been no new developments this year in the Comodoro Rivadavia field that have expanded the producing acreage. Consequently, while the Comodoro Rivadavia area is still the most important in Argentina, having contributed 73 per cent of the total production in the first 9 months, it offers less promise of spectacular expansion than do the newer areas in Mendoza.

Probably the most important new discovery in Argentina was scored by Y.P.F. in the vicinity of Barrancas, Province of Mendoza, where Y.P.F. L-3 struck a producing zone at 7,382 ft. which registered natural yield of 285 bbl. daily. Y.P.F. L-4, about 4.35 miles northwest of the discovery, which was drilled this year, confirmed the importance of the Barrancas area, when it produced 1,260 bbl. daily under natural conditions.

ING. RICARDO SILVEYRA

Tupungato Field Development

Additional exploration in the Tupungato field, also in the Province of Mendoza, has advanced that area to the stage of regular exploitation. Tupungato was discovered in 1938 and four test wells were drilled in 1939, all productive. It is of interest to note that No. T-19, the discovery well of the regular producing zone, had produced 613,505 bbl. to the end of September. No. T-22 produced 738,205 bbl. in the first 11 months of active operation, representing a daily average of 2,190 bbl. Both wells, Nos. T-19 and T-22, are still producing in a normal manner.

Conditions have been found more erratic in the new pool northwest of the national reservation in the Plaza Huincul district. Results in the pool, development of which was initiated in 1938, have varied widely in wells drilled by the Standard Oil Co. of Argentina and by Yacimientos Petroliferos Fiscales. The variance is probably due to abnormally irregular and complicated structural conditions.

The decrease of production in the Province of Salta in 1939 is due to a decline of 255,935 bbl. in the output of Standard which more than offset an increase of 188,860 bbl. from the Y.P.F. operated properties.

The national production of petroleum in the first 9 months of 1940 indicates a larger increase than in former years, as may be seen by the table, where a comparison is made of production for similar periods of the last 10 years.

CAPACITY OF ARGENTINA REFINERIES BY COMPANIES, 1940

Company—	No. of refineries	Location	Annual capacity (bbl.)	Annual prod. capacity (bbl.) Gasoline	Fuel oil	Lubricants	Sources of crude oil processed	Type of operation
Yacimientos Petroliferos Fiscales	1	Puerto de La Plata	10,379,325	2,491,050	5,189,660	150,970	National from Comodoro Rivadavia, Plaza Huincul, Salta	Complete
Yacimientos Petroliferos Fiscales	1	San Lorenzo, Santa Fe	3,145,250	1,415,360	1,509,720	.....	Comodoro Rivadavia, Mendoza, Salta	S-C, poly plant
Yacimientos Petroliferos Fiscales	1	Campana, Buenos Aires	629,050	327,105	88,065	.....	Mendoza, Plaza Huincul	S-C
Yacimientos Petroliferos Fiscales	1	Godor Cruz, Mendoza	188,715	37,745	75,485	.....	Mendoza (Tupungato)	S
Yacimientos Petroliferos Fiscales	1	Vespucio, Salta	163,555	35,855	106,940	.....	Salta	S
Yacimientos Petroliferos Fiscales	1	Plaza Huincul, Neguen	503,240	75,485	345,975	.....	Plaza Huincul	S
Total Y.P.F.	6		15,009,135	4,382,590	7,315,845	150,970		
Cia. Nativa	1	Campana, Buenos Aires	4,277,540	2,390,390	943,575	138,390	National from Salta, imports from Peru and Colombia	Complete
Cia. Nativa	1	Bahia Blanca, Buenos Aires	1,069,385	.....	.....	.....	National from Plaza Huincul	S-C-Reform
Standard Oil Co. of Argentina	1	Embarcacion, Salta	188,715	81,775	72,340	.....	National from Salta	S
Standard Oil Co. of Argentina	1	Plaza Huincul, Neguen	81,775	17,615	62,905	.....	National from Plaza Huincul	S
Total Standard group	4		5,617,415	2,489,780	1,078,820	138,390		
Diadema Argentina	1	Dock Sud, Buenos Aires	4,025,920	1,950,055	113,230		National from Comodoro Rivadavia	S-C-Reform
Cia. Ferrocarrilera	1	Comodoro Rivadavia, Chubut	2,012,960	503,240	1,383,910	50,325	National from Comodoro Rivadavia	S-C
Cia. Ultramar	1	Dock Sud, Buenos Aires	1,415,360	754,860	295,655	69,195	Imported from East Texas, Gulf Coast, Oklahoma, Colombia	Complete
Cia. Astra	1	Comodoro Rivadavia, Chubut	704,535	18,870	144,680	.....	National from Comodoro Rivadavia	S
Cia. La Isaura	1	Bahia Blanca, Buenos Aires	704,535	201,295	77,055	.....	Plaza Huincul, imported from Peru	S-C
Lottero, Papini Cia.	1	Avellaneda, Buenos Aires	182,425	51,120	8,175	27,050	Imported from Peru	S-L
Cia. El Condor	1	Avellaneda, Buenos Aires	163,555	42,145	8,175	25,160	Imported from Peru	S-L
Cia. Gral. Asfaltos	1	Wilde, F.C.S., Buenos Aires	61,020	.....	.....	15,725	National reduced crude from Comodoro Rivadavia	L
Ramon Gorleri and Cia.	1	Quilmes, Buenos Aires	37,745	8,175	3,145	5,345	Imported from Peru	S-L
Total other companies	9		9,308,055	3,529,760	2,034,025	193,520		
Grand total	19		29,934,605	10,462,130	10,428,690	482,880		

Note: S—Skimming; C—Cracking; L—Lubricating oil plant.

First 9 months—	Production in cu. meters*	Increase in cu. meters*
1931	1,347,299	.....
1932	1,527,755	180,456
1933	1,623,995	96,240
1934	1,636,914	12,919
1935	1,686,352	49,438
1936	1,763,456	77,104
1937	1,930,821	167,356
1938	2,010,961	80,140
1939	2,172,833	161,872
1940	2,408,068	235,235

*A cubic meter equals 6.2905 U. S. barrels of 42 gal.

The importance of Mendoza in current Argentina operations is accented by contribution of 1,195,590 bbl. of the increase in the first 9 months this year to the national increment of 1,479,745 bbl. The figures show that Mendoza accounted for 80.8 per cent of the national increase; Comodoro Rivadavia, 15 per cent; Salta, 3.9 per cent, and Plaza Huincul, 0.3 per cent.

Production by Regions

The comparative production for each region, by companies, is shown in the following table for the first 9 months of 1939 and 1940:

(All figures in cubic meters)

Region and companies—	9 mos. 1939	9 mos. 1940	Difference—Incr. 1940	Difference—Decr. 1940
Comodoro Rivadavia:				
Y.P.F.	979,889	993,609	13,720	.....
Astra	98,244	105,434	7,190	.....
DiademaArgentina	481,108	165,468	27,682	.....
Ferrocarrilera	178,893	165,468	.....	13,425
Net total	1,738,134	1,773,301	35,167	.....
Plaza Huincul:				
Y.P.F.	76,664	83,597	6,933	.....
Standard	78,614	73,669	.....	4,945
Astra	1,263	(*)	.....	1,263
Net total	156,541	157,266	725	.....
Province of Salta:				
Y.P.F.	56,510	91,087	34,577	.....
Standard	148,268	122,971	.....	25,297
Net total	204,778	214,058	9,280	.....
Province of Mendoza:				
Y.P.F.	72,349	263,443	191,094	.....
Rio Atuel Ltda.	1,031	.....	.....	1,031
Net total	73,380	163,443	190,063	.....

*Acquired by Y.P.F.

The increases obtained by Y.P.F. in the provinces of Mendoza and Salta this year are due to the normal exploitation of the Tupungato and Rio Pescado zones prosecuted this year.

Simultaneous with the increase in oil production, and as a natural consequence therefrom, refineries have been enlarged and new plants constructed. For example, Y.P.F. has placed in operation at the La Plata refinery a new combination unit for topping, cracking reduced crudes, cracking heavy and light gas oil, steam-phase treatment of gasoline and thermal polymerization with a total daily charging capacity of 9,435 bbl.

The polymerization plant handles propane and butane from previously existing portions of the La Plata refinery in addition to the output of these fractions from the newly installed combination unit. During 1939, the nation's refineries handled 23,525,845 bbl. of crude oil of which 18,452,420 bbl. came from domestic fields. The other 5,073,425 bbl. were imported.

Petroleum products obtained from 1939 refinery operations are shown in the following table:

(Figures in cubic meters)

Products—	Y.P.F.	Private companies	Total
Aviation gasoline	2,087	9,441	11,528
Regular gasoline	452,578	904,627	1,357,385
Kerosene (tractors)	86,914	121,915	208,829
Gas oil	22,789	85,651	108,440
Diesel oil	67,487	230,248	297,735
Fuel oil	848,049	402,594	1,250,643
Lubricants	23,591	57,842	81,433
Greases	*855	.....	*855
Turpentine, solvents	5,688	10,929	16,617
Asphalts	24,000	24,376	48,376

*Metric tons.

In the first 6 months of 1940, the total amount of crude oil refined reached 12,254,170 bbl. of which 10,286,880 bbl. were from domestic sources and 1,967,290 imported from other countries. The products obtained were as follows:

(Figures in cubic meters)

Aviation gasoline	4,473
Regular gasoline	647,400
Kerosene (tractors)	99,783
Gas oil	57,067
Diesel oil	159,700
Fuel oil	735,951
Lubricating oils	34,613
Asphalts	31,571

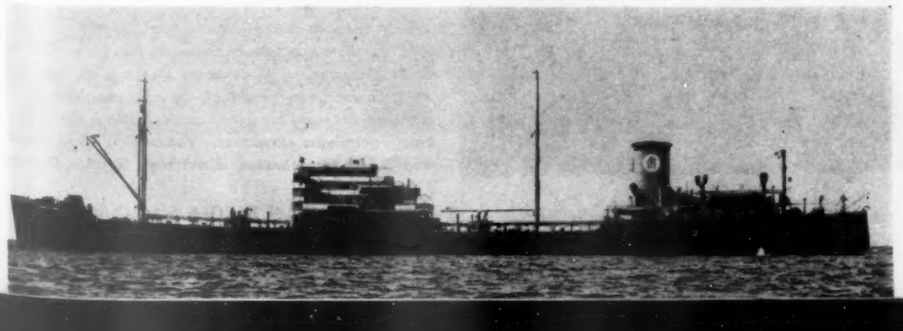
The consumption of petroleum products for the entire country during 1939 was as follows:

(Figures in cubic meters)

Regular and aviation gasoline	1,313,700
Kerosene, all grades	239,550
Gas oil	153,450
Diesel oil	660,982
Fuel oil	2,411,016
Lubricating oils	84,911
Total	4,863,609

Y. P. F. natural-gasoline plant at Comodoro Rivadavia

The Y. P. F. tanker "San Jorge," of 10,500 tons



Yacimientos Petroliferos Fiscales has two new refineries under construction that will be placed in operation by January 1, 1941. Both plants are new combination units. One is near the city of Salta and has a daily capacity of 1,890 bbl., which will be supplied by fields in the northern part of the country. The other new refinery is at Lujan de Cuyo, Province of Mendoza, and it has a daily capacity of 3,145 bbl.

War Exerting Strong Influence On Venezuelan Oil Industry

By LUIS HERRERA-FIGUEREDO
Government Chief Petroleum Inspector

CARACAS, Venezuela.—The petroleum industry in Venezuela has been obviously affected by the European conflict, especially since the rapid succession of events in the second quarter of the present year changed the economic frontiers of the countries that integrate the old continent, thus disrupting the natural equilibrium that existed between production and consumption forces in the whole world. The influence of the present international situation upon the Venezuelan petroleum industry can be best appreciated with a view to our production, here specified by companies, considered as a fair general index of all petroleum developments in this country:

PRODUCTION (Metric Tons*)

	June 1940	Oct. 1940	Per cent October with reference to June
Standard Oil Co. (N. J.) group	1,394,319	756,121	54.2
Dutch-Shell group	899,177	757,318	84.2
Mene Grande Oil Co.	460,958	528,223	114.6
Others	11,634	11,492	98.8
Total	2,766,088	2,053,154	74.2

*Average conversion rate 6.703 bbl. per metric ton.

The average factor for converting metric tons of Venezuelan crude oil to United States barrels used by the Bureau of Mines is 6.703 bbl. per ton. Gravity of Venezuelan oil ranges from 13.5° at Tia Juana to 53.3° at Santa Ana. Because of the wide range of gravity it is essential to consider weight in converting production of individual fields from tons to barrels.

Production and Exports

Crude-oil production of Venezuela during 1940 can be estimated to be in the neighborhood of 186,000,000 U. S. bbl. showing a decrease of nearly 10.6 per cent below the 1939 record mark, thus constituting the lowest production total since 1936. The distribution of such curtailment among the different producing fields can be analyzed with the help of the accompanying table, where individual production figures for the period January-September in 1940 and 1939 are compared.

Venezuelan crude-oil exports are expected to drop to the 161,000,000-bbl. level—also the lowest since 1936—showing a reduction of 16.2 per cent under last year's maximum figure.

Refining

Refining facilities have been remarkably developed in Venezuela since the beginning of 1939. The amount of oil processed in this country in 1939 showed an increase of nearly 45 per cent over 1938, and this upward trend has been felt more intensely during the present year, when 17,600,000 bbl. of crude have been processed in the January-September period, an increase of 97 per cent over the same period in 1939.

As we stated before in our report covering oil developments in Venezuela during 1939, this almost twofold increase has been made possible due to the expansion of the refining facilities of the Caribbean Petroleum Co., at San Lorenzo; Standard Oil Co. of Venezuela, at Caripito, and Compania de Petroleo Lago, at La Salina. Monthly average throughput in the last-named plant was 214,000 bbl. during the first 8 months of 1940, climbing up to 764,000 bbl. in September.

New Fields

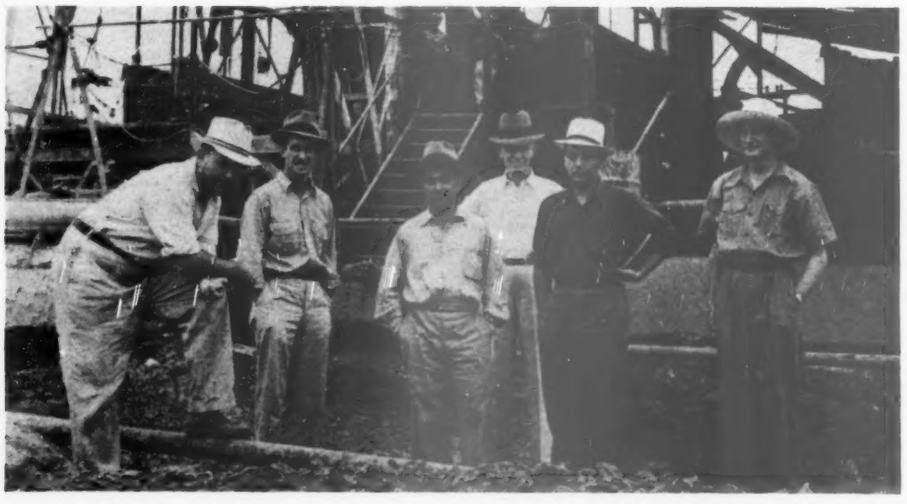
Three new fields were brought under development during 1940 in eastern Venezuela, namely: San Joaquin, El Roble, and Santa Ana. At San Joaquin, the most important, the Mene Grande Oil Co. had completed six producing wells up to October 1, while drilling was proceeding at four new locations. The gravity of the oil encountered in the San Joaquin field oscillates around 41.5° A.P.I., and the average production of the wells so far completed is about 710 bbl. daily.

At El Roble, north of the San Joaquin field, the Standard Oil Co. of Venezuela has completed

VENEZUELA PRODUCTION BY FIELDS AND COMPANIES

Company—	Field	Production Jan.-Sept. 1939 (metric tons)	Production Jan.-Sept. 1940 (metric tons)	Per cent decrease or increase over 1939
Venezuelan Oil Con., Ltd., Lago Pet. Corp., and Mene Grande Oil Co., C.A.	Lagunillas	8,046,772	7,289,807	—9.4
Venezuelan Oil Con., Ltd., Lago Pet. Corp., and Mene Grande Oil Co., C.A.	Tia Juana	5,743,388	4,393,209	—23.5
Standard Oil Co. of Venezuela	Quiriquire	2,967,752	2,449,596	—17.5
Venezuelan Oil Con., Ltd., Lago Pet. Corp., and Mene Grande Oil Co., C.A.	Cabimas*	2,602,783	2,236,248	—14.1
Mene Grande Oil Co., C.A., and Standard Oil Co. of Venezuela	Oficina	Not producing	1,420,821	....
Caribbean Petroleum Co.	Mene Grande	1,342,378	1,192,462	—11.2
Colon Development Co., Ltd.	El Cubo†	575,272	662,235	+15.1
Lago Pet. Corp., Standard Oil Co. of Venezuela, and Mene Grande Oil Co., C.A.	Temblador	379,337	435,508	+14.8
Standard Oil Co. of Venezuela	Jusepin	Not producing	424,568	....
Standard Oil Co. of Venezuela	Pedernales	207,874	201,201	—3.2
Venezuelan Oil Concessions, Ltd.	Bachaquero	420,573	194,131	—53.8
Standard Oil Co. of Venezuela	Cumarebo	248,715	172,289	—30.7
Mene Grande Oil Co., C.A.	San Joaquin	Not producing	87,306	....
Venezuelan Oil Concessions, Ltd.	La Concepcion	90,689	85,412	—5.8
Central Area Exploitation Co.	Hombre Pintado	48,542	71,699	+47.7
Standard Oil Co. of Venezuela	El Roble	Not producing	49,388	....
Venezuelan Oil Concessions, Ltd.	La Paz	60,574	47,631	—21.4
British Controlled Oilfields, Ltd.	El Mene de Mauroa	41,155	33,169	—19.4
Mene Grande Oil Co., C.A.	Santa Ana	Not producing	8,163	....
Standard Oil Co. of Venezuela	Las Palmas	5,718	4,969	—13.1
Texas Co.	Los Caritos	Not producing	1,931	....
Mene Grande Oil Co., C.A.	El Tigre	Not producing	1,308	....
Standard Oil Co. of Venezuela	Socororo	Not producing	1,130	....
Socony-Vacuum Oil Co.	Guario	Not producing	690	....
Tocuyo Oilfields of Venezuela, Ltd.	El Mene de Acosta	Closed	182	....
Standard Oil Co. of Venezuela	Tabasca	Not producing	134	....
Total		22,781,522	21,465,187	—10.6

*Includes La Rosa, Ambrosio, and Punta Benitez fields. †Includes Rio Tarra and Los Manueles fields.



Operating men and Venezuelan officials gathered at Guarico Oilfields of Venezuela 2 El Gyayabo, a wildcat test in the State of Guarico. Seen here are: R. N. Wright, drilling superintendent for Guarico Oilfields; E. L. Gorham, petroleum engineer, the Texas Co.; Dr. S. E. Aguerrevere, Venezuelan Government geologist; A. C. Lawder, vice president, Caracas Petroleum Corp.; Dr. Luis Herrera-Figueredo, author of this review and chief petroleum inspector, Venezuelan Government, and H. C. W. Johnston, director of Guarico Oilfields

its second producing well, and two new locations are being drilled. Average daily production of both El Roble wells is 3,000 bbl. of 43.9° gravity oil.

Finally, about 25 miles northwest of Oficina field the Mene Grande Oil Co. has completed two wells at Santa Ana, while a third location is approved. Gravity of Santa Ana oil is as high as 53.3° A.P.I.

Wildcatting Operations

In the State of Anzoategui the Mene Grande Oil Co. made an important discovery in 1 Leona, completed on October 23 for 1,000 bbl. of 28° A.P.I. oil. This well, which might be considered one of the best so far drilled in Anzoategui, has caused the operating company to proceed immediately on two other locations. Work is progressing in the State of Anzoategui at several other wildcats located in concessions belonging to the Mene Grande Oil Co., Standard Oil Co. of Venezuela, Texas Co., and Socony-Vacuum Oil Co.

Heretofore, for one reason or another, all wildcats drilled in the State of Guarico have been unsuccessfully completed. Not counting the wells located in the most southern area of the state, which might be more accurately considered as geological tests, the Mene Grande Oil Co. and the Guarico Oilfields of Venezuela have abandoned their wildcats, 1 Gorrin and 1 and 2 Guayabo, in Central Guarico. Nevertheless, Mene Grande has made another location near 1 Gorrin, while the Compania Anonima Petrolera Las Mercedes, a newly registered company in which the Texas Co. has a leading interest, has started operations at 1 Las Mercedes, near El Guayabo. On the other hand the Standard Oil Co. of Venezuela is drilling ahead at 5,600 ft. in its 1 Ollas wildcat in the eastern part of Central Guarico, which promises to be a very interesting test.

In the State of Monagas, at Los Caritos, the Texas Co. brought in its first producer in Venezuela towards the end of the first quarter of this year. The second wildcat did not prove successful, but the company has already proceeded to make its third and fourth locations in this area. Furthermore, the Compania Consolidada de Petroleo (Consolidated Oil Corp.) initiated active operations in Venezuela by locating its first wildcat, 1 Santa Barbara, southwest of Jusepin field.

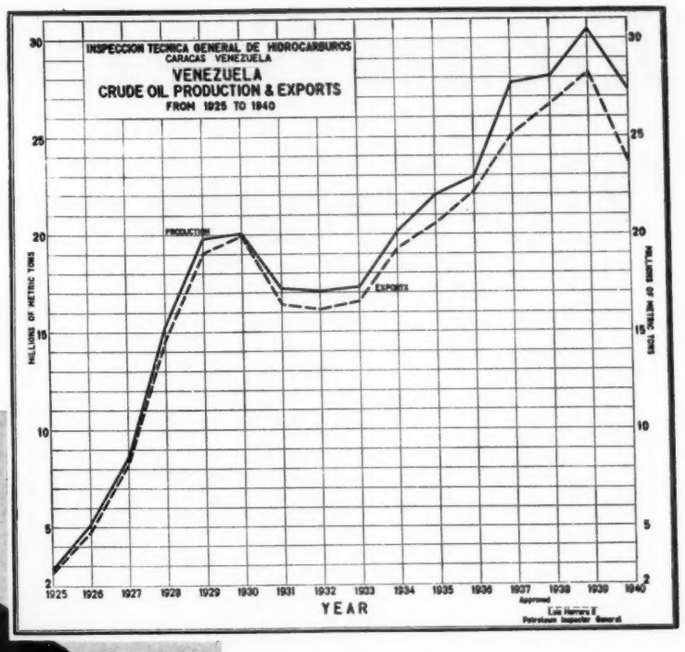
Miscellaneous

On December 18, 1939, the president of Venezuela opened the first Conference of Government Petroleum Inspectors, and inaugurated the new Museum of Minerals, Rocks and Fossils in the building occupied by the Department of Fomento. The conference lasted 3 days and many interesting topics were thoroughly discussed.

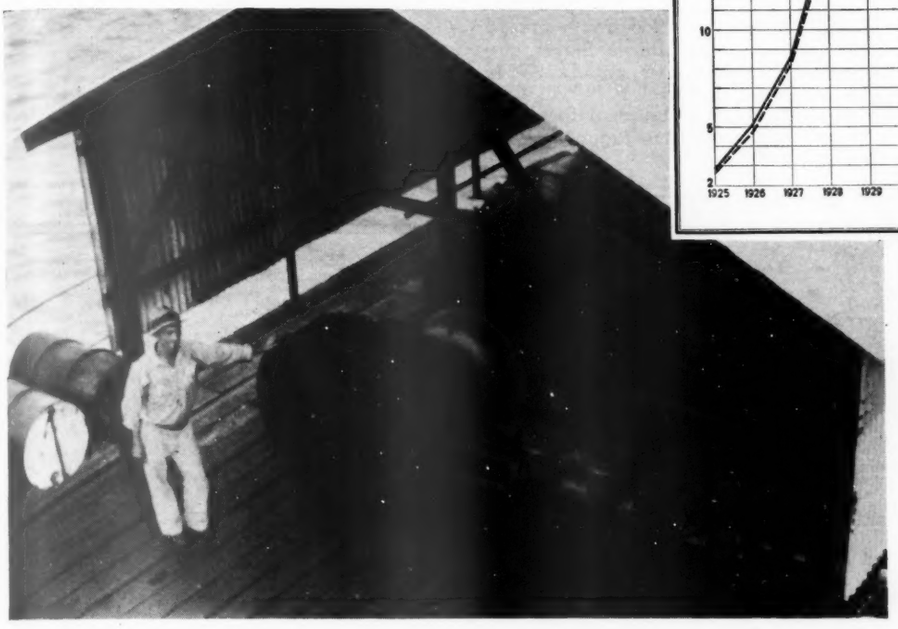
On October 1, the federal executive dictated a resolution whereby the consumption taxes on fuel oils were lowered tenfold, this substantial reduction being a far-reaching step by which the government reinforces its policy to stimulate by all means at its disposal the industrial and agricultural development of the country. By the same resolution, consumption taxes on gasoline were raised 33 per cent, this measure responding to the necessity to counterbalance the decrease of the fiscal tax income, which has been affected by contingencies of the European war. This emergency measure is considered as of a temporary character only.

On October 22, the first Petroleum Industry Exhibition was inaugurated by the president of the Republic. This exhibition is being sponsored by the Department of Fomento and the three principal oil-producing companies in Venezuela, namely: Standard group, Shell group, and the Mene Grande Oil Co.

Chart showing interruption of the steady climb of Venezuelan production and petroleum exports this year


INSPECCION TECNICA GENERAL DE HIDROCARBUROS
CARACAS VENEZUELA
VENEZUELA
CRUDE OIL PRODUCTION & EXPORTS
FROM 1925 TO 1940
PRODUCTION
EXPORTS
MILLIONS OF METRIC TONS
YEAR
1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940

Below: Pumps on the superstructure over the waters of Lake Maracaibo, Venezuela



Power unit mounted behind pipe rack on Venezuelan drilling well

Japan Seeks N.E.I. Oil for "Co-Prosperity Sphere"

By The Oil and Gas Journal's Far Eastern Correspondent

TOKYO, Japan.—The year now drawing to a close was devoid of important developments in the technical phases of the Japanese oil industry, but significant changes were witnessed in the political border field.

It was the fourth year for which no official Japanese production statistics are available. Estimates for 1937, 1938 and 1939 did not deviate substantially from the authentic figure for 1936 which placed crude-oil production at the equivalent of 2,445,000 bbl. From all available evidence there is no reason to suspect that production this year has moved away from this statistical landmark by any considerable margin either way.

Labor statistics indicate that employment in the fields had increased 16 per cent on July 1937, bringing the total to 4,336 men employed. It is, however, not justifiable to assume that production has increased on a comparative scale, largely because the continued shortage of equipment has most likely offset the enhanced labor capacity, an observation which applies to recent Japanese mining activities in general. For instance, the aggregate increment in mining employment since the outbreak of the China hostilities is 21 per cent, whereas the official index of mining activity is still closely hugging to pre-"incident" levels.

Applications for prospecting subsidies totaled 11, on 141 projects, 92 of which were authorized at an expense of 8,200,000 yen. A lion's share of nearly 6,000,000 yen went to the Japan Petroleum Co. The 1940 schedule of this firm called for 142 wells, including 73 subsidized wells. Of these, 106 were to be drilled in Akita prefecture, 12 in Taiwan (Formosa), and 6 at Kashiwazaki, Niigata prefecture.

As in previous years, Niigata was by far the most active district. Considerable development work was undertaken at Karameki, near Niitsu, Niigata. Promising fields were reported discovered in Formosa and in the Hokkaido. The Yabase field showed increasing signs of superannuation, but Omonogawa, nearby, became extremely active.

An attempt to produce oil within the city limits of Tokyo, which received much publicity, brought no results, and the year also saw the failure of a wildcatting ventures at the foot of Mount Fuji.

Operation results of the North Sakhalin Oil Co. were again shrouded in secrecy. The Japanese trade press carried reports charging that the Soviet oil trust is "recklessly" stepping up production, thereby limiting the opportunities of the Japanese licensees. One cause of Soviet-Japanese friction was removed in September when the Japanese agreed to observe Soviet labor regulations as regards pay and working hours.

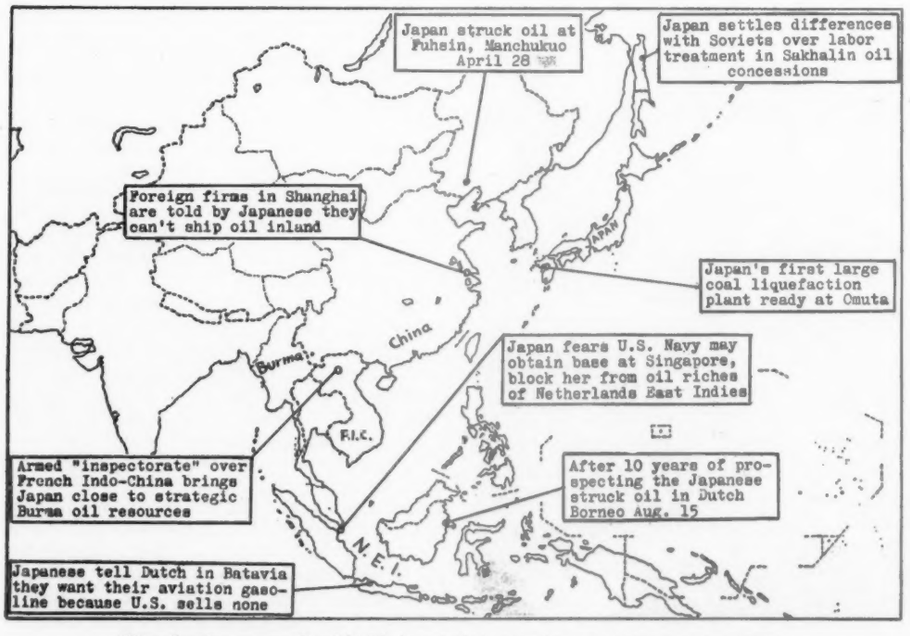
Japanese hopes for petroleum in Manchukuo were revived by reports that the first wildcat drilled near Fuhsin, Jehol Province, had proved a producer of considerable promise. The Manchuria Petroleum Co., which had been in charge of operations, was unable to follow up this success because of lack of equipment and skilled labor, and up to the present no further developments have been reported.

CONVERSION FACTORS

The Japanese yen is currently quoted at 23.48 cents in United States currency. One hectoliter equals 0.6284 United States oil barrel of 42 gal. One kiloliter equals 6.284 United States oil barrels of 42 gal. One Japanese koku equals 47.65 gal.

RESULTS OF IMPORTANT WELLS DRILLED IN JAPANESE TERRITORY

Type and number of well	Name of field	Depth meters	Name of company	Initial yield "koku" (47.65 gal.)	Density
Rotary No. 17	Yabase	830	Japan Petroleum	....	.....
Rotary No. 10	Kashiwazaki	1,559	Japan Petroleum	30-50	.....
Koya No. 6	Akita	....	Japan Mining	100	34.5 Be
Koya No. 11	Niitsu	1,425	Japan Petroleum	85	29 Be
Koya No. 2	Akita	152	Kokura Petroleum	....	....
Tsuna No. 62	Omonogawa	88.3	Japan Petroleum	50	32.4 Be
Kazusa No. 73	Omonogawa	74.5	Japan Petroleum	60	32.4 Be
Kazusa No. 75	Omonogawa	80	Japan Petroleum	30	29.2 Be
Tsuna No. 61	Omonogawa	243.8	Japan Petroleum	150	40.1 Be
Test No. 3	Toyolawa	792.3	Japan Petroleum	15	.....
Rotary No. 10	Niita	963	Japan Petroleum	200	.....
Rotary No. 13	Kotaki	410	Japan Petroleum	60	.....
Rotary No. 18	Kotaki	400	Japan Petroleum	50	.....
Rotary No. 10	Hitoida	963	Japan Petroleum	200	.....


Japan struck oil at Fuhsin, Manchukuo April 28
Japan settles differences with Soviets over labor treatment in Sakhalin oil concessions
Foreign firms in Shanghai are told by Japanese they can't ship oil inland
JAPAN
Japan's first large coal liquefaction plant ready at Omuta
China
Burma
Japan fears U.S. Navy may obtain base at Singapore, block her from oil riches of Netherlands East Indies
F.I.C.
Armed "inspectorate" over French Indo-China brings Japan close to strategic Burma oil resources
After 10 years of prospecting the Japanese struck oil in Dutch Borneo Aug. 15
N.E.I.
Japanese tell Dutch in Batavia they want their aviation gasoline because U.S. sells none

Map showing geographical highlights of 1940 petroleum developments for Japan

Two Aviation-Fuel Plants Completed

Japan's refinery construction program was handicapped partly by lack of funds and construction materials, and partly by the American embargo on equipment and blueprints, and so far as is known from the trade press, not a single ordinary plant was completed. The Maruzen Petroleum Co. undertook an increase in capitalization from 15,000,000 to 25,000,000 yen, largely for the purpose of obtaining funds for construction of additional refining facilities at Shimotsu. The Daikyo Oil Co., a 5,000,000-yen concern, was planning last March to build a Badger plant at Yamagishi, but it is not known how far preparations have progressed. The Japan Synthetic Chemical Co. was planning last March to enlarge its capacity for the production of carbon electrodes from pitch coke. The plan envisioned production of 6,000 tons of pitch coke.

The first Japanese plant to produce high-test aviation fuel similar to those imported from the United States prior to the enforcement of the embargo was completed May 21 by the Mitsubishi Oil Co., at Kawasaki near Yokohama. The plant is a polymerization unit producing isooctane from cracking gases. Equipment was furnished by Universal Oil Products Co. in cooperation with Tide Water Associated Oil Co., which has a 50 per cent stake in Mitsubishi Oil. A similar unit was completed in August by the Japan Petroleum Co.

A year and a half ago the Army had sponsored organization of a 50,000,000-yen Toa Nenryo

Kogyo K.K. (East Asia Fuel Industry Co., Ltd.), which was to produce aviation fuel by one of the newer American catalytic cracking processes. This part of the plan was circumvented by the American ban on exports of equipment and blueprints to Japan, and the firm subsequently announced that it was going to industrialize a secret process of the Army. Construction on a plant started some time ago at Shimizu.

It was also reported in April that the Tohoku Industrial Development Co. had abandoned its project of producing power alcohol in favor of a plan to produce isooctane from butyl alcohol.

A pilot plant producing an unspecified aviation fuel by cracking of coal tar went up in Sakhalin. Backer of the project is the Tokyo Gas Co. The Nikkan Kogyo Shimbun reported September 26 that the Ubé Nitrogen Industrial Co. had succeeded in producing a synthetic fuel of 95 octane. Other details were lacking.

In July, Chosen (Korean) Petroleum Co. was reported raising 5,300,000 yen for the purpose of building an isooctane plant at Genzan. Installations were to be completed by September, 1941.

Local production of tetraethyl lead fluid was planned by two chemical concerns as two of the three patents protecting the use of the lead compound in motor fuels expired in 1940. The remaining patent will mature shortly. The patents were taken out 15 years ago by General Motors Research Corp. and later assigned, through Ethyl Gasoline Corp., to Asano Bussan Kaisha. However, Asano did not produce the chemical in Japan.

Synthetic Fuel Program Is Pushed

A 7-year plan, subsequently shortened to 5 years, calls for production of 2,000,000 tons (16,000,000 bbl.) of synthetic fuel in Japan and Manchukuo in 1941. Conditions under which the plan was started made it appear less visionary than it appears today, on the eve of the "goal year."

Progress in plant construction has been very slow and has been further impeded by the outbreak of the European war, which put an end to the importation of construction materials from Germany. Such plants as have been completed are white elephants because there is not enough coal to go round. Two million tons of liquid fuel require an input of 8,000,000 to 12,000,000 tons of coal, but Japan has not enough of it to meet ordinary industrial requirements, and imports were made in 1940 from Colombia, Canada and British India, besides from French Indo-China and a British colliery concern in North China. The shortage of coal was, indeed, so acute that several heavy industrial plants in Osaka were reported "substituting" heavy oil for coal as furnace fuel.

Only one of the several larger plants under construction was partly completed, viz., the Fischer-Tropsch plant, at Omuda, Kyushu, a Mitsui enterprise. Though planned for an ultimate annual capacity of 30,000 tons, the section now operating was reported producing at the rate of only 1,000 tons a year.

Three smaller plants, for hydrogenation of low-temperature tar, also had their first runs. These are the Ubé plant of the Ubé Coal Liquefaction Co.; the Hokkaido plant of the Japan Synthetic Oil Co.; and the Futajima plant of the Nissan Synthetic Oil Co. Work was started on the construction of a plant at Rumoe, Hokkaido, by the Imperial Fuel Development Co., the semigovernmental holding concern which has a stake in most fuel projects. At the close of May, Imperial Fuel had invested in 12 projects, underwriting a total amount of 269,000,000 yen, though actually it had not paid out more than 73,000,000 yen.

The Chinchow plant of the Manchuria Synthetic Fuel Co. was reported ready for operation "in the near future" at the end of June. This is another large Fischer-Tropsch plant, with a nominal capacity of 52,000 tons, including 30,000 tons of gasoline.

PRESENT STATUS OF JAPAN'S COAL LIQUEFACTION INDUSTRY

Name of Company—	Location of plant	Capital 1,000 yen	Process	Patents	Completion
Japan Proper					
Amagasaki Art. Oil Co.	Amagasaki	30,000	HPSyn	Fischer	Feb. 1941
Ube Nitrogen Co.	Ube	7,500‡	LTD	Koppers	In operation
Ube Coal Lique. Co.†	Ube	50,000	LTD+LTTH	Koppers	Late 1941
Tokyo Gas Chem. Co.	Yokohama	10,000	LTD	Tokyo Gas Co.	In operation
Toho Chem. Co.	Nagoya	15,000	LTD	Tokyo Gas Co.	In operation
			LTTH		Jan. 1941
Nissan Liqu. Fuel Co.†	Wakamatsu	10,000	LTD	Lurgi	July 1940
			LTTH		Sept. 1941
Japan Iron Mfg. Co.	Muroran	1,400	LTD	Own	In operation
Japan Coal Liqu. Co.†	Kawasaki	10,000	LTTH		In operation
Hokkaido Art. Oil Co.†	3 plants	70,000	HPSyn	Fischer	June 1941
Mitsui Mining Co.	Omuda	31,500‡	OPSyn	Fischer	In operation
Sakhalin					
Sakhalin Art. Oil Co.†	Naien	40,000	LTD	Lurgi	Feb. 1942
			LTTH	Lurgi	Dec. 1943
Mitsui Coal Liqu. Co.	Naihoro	20,000	LTD	Lurgi	In operation
Korea					
Chosen Coal Ind. Co.†	Agochi	45,000‡	LTD+LTTH	Lurgi	In operation
Chosen Nitrogen Co.	Helan	7,700‡	LTD	Lurgi	In operation
Manchukuo					
Kirin Art. Oil Co.†	Kirin	100,000	DL	Own	Late 1941
Manchu Synth. Fuel Co.†	Chinchow	50,000	OPSyn	Fischer	March 1941
Manchu Coal Liqu. Co.	Ssupingkai	50,000	LTD+LTTH		Test runs
South Manch. R'y Co.	Fushun	14,000‡	DL	Own	Early 1941
Manchu Coal Lqui. Lab'y	Mukden	6,000	DL		In operation

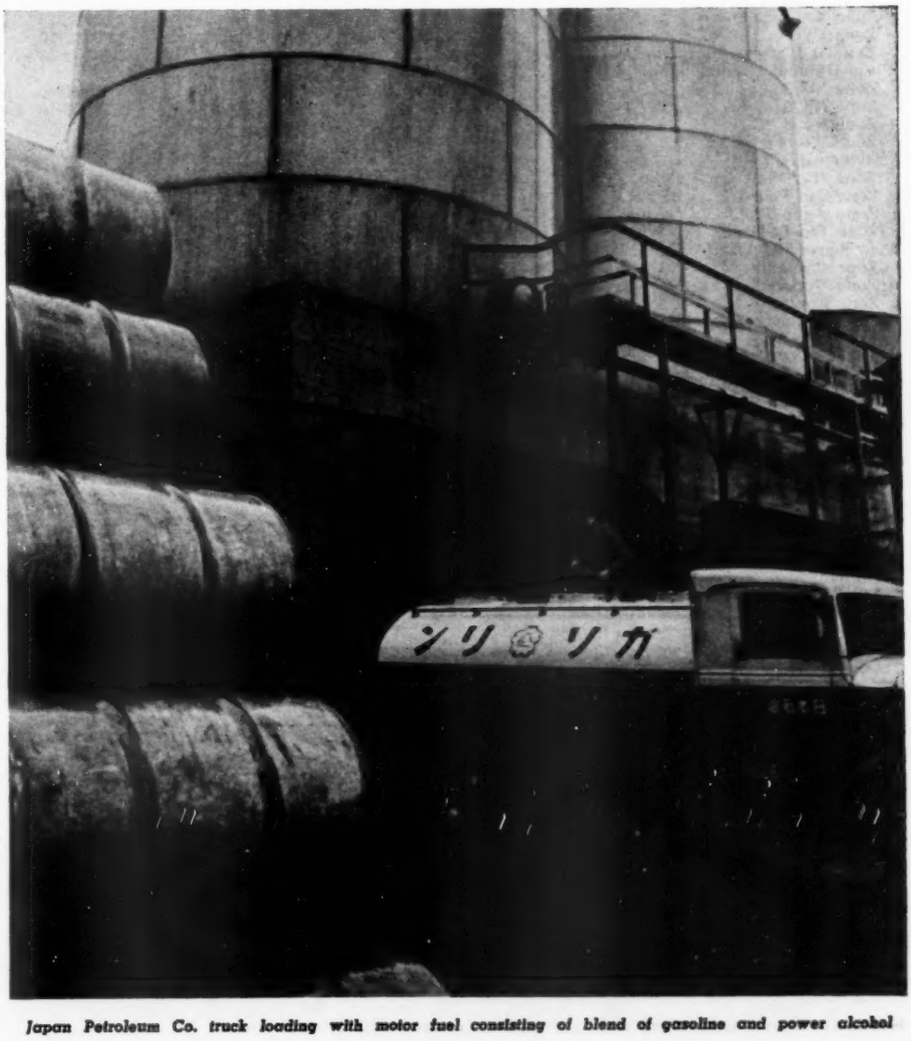
†Marks firms in which the official Imperial Fuel D evelopment Co. has invested.
‡Firms undertaking coal liquefaction as part activit y have their capital figures reduced to the amounts actually expended on synthetic fuel plants.
LTD—Low-temperature distillation; LTTH—Hydroge nation of low-temperature tar; DL—Direct liquefaction of coal by hydrogenation; HP—High pressure; OP—O rdinary pressure; Syn—Synthesis.

Substitutes Replace Gasoline

Consumption for all but military purposes was subject to increasingly stiffening regulations, and substitute fuels ranging all the way from natural gas to sawdust and "coalite" (a semicoke available as byproduct of low-temperature carbonization of coal) came into common use, with the result that some of them, notably charcoal, had to be subjected to rationing also.

Two government-owned alcohol plants of 40,000-koku capacity were completed, and work was started on five more, also of 40,000-koku capacity. The government alcohol-monopoly bureau also

(Continued on Page 108)



Japan Petroleum Co. truck loading with motor fuel consisting of blend of gasoline and power alcohol

General view of Standard Oil Co. of Venezuela's Caripito camp, taken from water tower near hospital

Survey of World Oil Fields

ALBANIA

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet	Age of field (years)
Devoli	475	3,750	17	1,950-2,950	16	A.	P.L.	6

ARGENTINA

(Development as of September 30, 1940)

Comodoro Rivadavia (Chubut):								
Zone A, (Costa)	1,784	11,750	9	2,200-2,500	22.3	A.-P.	Tankers	33
Zone B, (Escalante)	631	26,475	25	3,675-3,775	31	A.-P.	Tankers	16
Zone C	405	2,856	3	1,970-2,150	19.8	A.-P.	Tankers	24
Zone D (Colonia Sarmiento)	....	.....	....	2,295-2,625	23	A.-P.	Tankers	7
Plaza Huincul (Neuquen):								
Zone No. 1	46	113	....	1,875-1,990	32	P.	Tank cars	22
Zone No. 2	128	2,705	2	2,365-2,510	31.7	P.	Tank cars	14
Zone No. 3	84	818	....	2,400-2,590	33.5	P.	Tank cars	16
Zone No. 4	....	.....	....	3,360-3,365	38.5	P.	Tank cars	6
Province of Salta:								
Zone Tartagal	109	1,894	2	1,470-1,770	43.4	P.	Tank cars	14
Zone San Pedro	28	2,365	....	2,900-2,975	45.5	P.	Tank cars	12
Zone Agua Blanca	4	207	1	4,590-4,920	23	A.	Tank cars	14
Zone Rio Pescado	7	465	3	4,100-4,389	23	A.	Tank cars	1
Province of Mendoza:								
Zone Cacheuta	25	132	1	2,000-2,050	30.7	A.-P.	Tank cars	9
Zone Tupungato	12	5,692	4	5,810-6,000	30.2	P.	Tank cars	7
Zone Lunlunta	1	220	3	7,055-7,098	29.6	P.	Tank cars	1
Zone El Sosneado	....	.....	....	545-555	13	A.	Tank cars	15
Total	3,264	55,692	53					

ALBERTA, CANADA

Turner Valley, 40 miles south of Calgary								
Limestone crude	125	21,600	20	6,800-8,600	39-48 av. 43	Intermediate (wax brg.)	P.L.-Ref.	4½
Limestone distillate	102	200	....	3,700-6,800	55-73	do	P.L.-Ref.	16
Limestone natural gasoline	above	720	....	.....	73	Paraffin	P.L.-Ref.	..
Shallow crude	3	20	....	3,200-3,700	49-50	Intermediate (wax brg.)	P.L.-Ref.	26
Red Coulee, Montana border	7	33	....	2,500	30	Intermediate	Rail-Ref.	11
Wainwright, 150 miles east of Edmonton	4	20	....	2,200	18-22	Hybrid.	Local	15
Miscellaneous:							Local	5
Dina, Saskatchewan border	2	9	....	1,700	14	Naphthenic.		
Lloydminster, Saskatchewan border	1	5	....	1,800	14	Naphthenic.	Fuel	1
Vermilion, near Saskatchewan border	2	80	2	1,800	14	Naphthenic.	Fuel	1
Moose Dome, 30 miles west of Calgary	1	1	2	1,600	48	Intermediate	Local	3
Del Bonita, Montana border	1	7	....	5,000	36	Intermediate	Local	3
Total Alberta	247	22,695	24					

BAHREIN ISLAND, Persian Gulf

Bahrein Island, Persian Gulf	71	20,000	1	{ 2,000-2,250 } { 4,000-4,600 }	33.5	M.	Refinery	8

Bahrein Petroleum Co., Ltd., (Texas Co. and Standard Oil Co. of California) produces and refines all petroleum.

BOLIVIA

Sanandita, Tarija Dept.	6	250	1	1,345-2,017	41.5	P.	Refinery	14
Camiri, Santa Cruz Dept.	3	295	1	2,815-3,300	52.5	P.	Refinery	13
Bermejo	4	.....	0	699-3,675	...	..	Shut in	..
Buena Vista	1	.....	0	3,166	...	..	Shut in	..
Camatindi	3	.....	0	2,346-4,806	...	..	Shut in	..
Saiporo	1	.....	....	2,073-2,730	...	..	Shut in	..
Total Bolivia	18	545	2					

NOTE: War censorship interfered with obtaining 1940 information on a few countries.

COLOMBIA

Name of field and location--	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity	Base of crude	Outlet	Age of field
Infantas, Santander	451	10,300	0	2,000	25.4	Mixed	Local & Export*	22
La Cira, Santander	653	51,000	5	3,500	25.4	Mixed	Local & Export*	14
Petrolea, N. Santander	62	15,000	7	475-1,600	43	Mixed	Line to Covenas†	‡7
Rio de Oro, N. Santander	8	Shut in	1	2,400	30	Mixed	None‡	§3
Carbonera, N. Santander	1	40	1	1,900	19	Mixed	Local	¶2
Total Colombia	1,091	75,077	14					

*Crude produced by Tropical Oil Co. (International Petroleum Co., Ltd.) Part of crude refined locally. Remainder transported to coast by Andian National Corp., Ltd. †Crude produced by Colombian Petroleum Co. (Texas Co. and Socony-Vacuum Oil Co., Inc.). ‡Although Petrolea was proven productive in February 1933, the South American Gulf pipe line which extends from the Barco concession to the shipping terminal at Covenas, was placed in operation in October 1939. §The first producer at Rio de Oro was completed in November 1937. ¶This field has been producing road oil since July 1, 1939.

CUBA

Bacuranao, Habana	10	10	0	400-1,200	29-33	M.	Local	35
Motembo	145	300	8	800-1,200	59-61	Dist.	Local	60
Total Cuba	155	310	8					

CZECHOSLOVAKIA (Now Germany)

Gbely (Egbell)	7	288	3	540- 790	20	M.	Local	28
Hodonin (Guding)	15	127	2	425- 485	19	M.	Local	20
Total Czechoslovakia	22	415	5					

DOMINICAN REPUBLIC

Maleno	2	*50	..	475	19	P.	Fuel	2

*Production varies according to fuel requirements. Tests at Quita Coraza and El Magote were not successful.

ECUADOR

El Tambo	6	5	0	1,200	34	N.	Refinery	9
Concepcion	9	40	1	.....	38	M.	....	10
Cautivo	78	170	2	30-1,000	18-32	M.	....	18
Ancon	485	5,950	3	1,200-3,800	36-41	P.M.	....	20
Carolina and Santa Paula	15	90	1	30- 600	18-28	M.	....	8-22
Total Ecuador	593	6,250	7					

Note: The Cautivo and the Carolina-Santa Paula fields contain pits averaging 30 ft. in depth and producing small amounts of low-gravity oil and deeper wells which produce the high-gravity crude.

EGYPT

Hurghada	75	2,200	0	1,595-1,720	36	M.	Refinery	27
Ras Gharib	32	15,880	5	3,500	38	M.	Tankers	3
Total Egypt	107	18,080	5					

FRANCE

Pechelbronn, Bas Rhin	763	1,421	17	820-3,050	29.5	P.	....	204
Bon Draa, Morocco	35	89.5	3	270-3,115	(*)	..	....	3
Tselfat, Morocco	49							
Tliouanet, Algeria	11	5.2	1	.....	....	..	....	28
Total France	858	1,515.7	21					

*Gravity unavailable but low.

GERMANY

Old Reich:								
Nienhagen	...	6,269	..	3,600	30	P.	....	78
Wietze	...	811	..	985	18	A.	....	80
Oberg	...	264	..	1,300	35	P.	....	20
All others	...	5,095	..	.....	25	Var.	....	..
Total	...	12,441	..					
Ostmark (Austria):								
Zistersdorf and Gaiselberg	...	2,033	..	3,600	23	P.M.	....	7
Slovakia and Moravia	22	415	..	425-1,300	27	M.	....	25
Former Poland	1,646	3,080	..	150-3,900	....	..		
Total for Greater Germany	...	17,969	..					

Note: There is no information available on the number of producing or drilling wells in Germany.

HUNGARY

Bukkszek	26	50	2	335- 340	34	P.	P.L.-T.C.	4
Budafapuszta	54	5,500	4	3,675-4,100	40	P.	P.L.-T.C.	4
Total Hungary	80	5,550	6					

INDIA-BURMA

India:								
Digboi, Assam	200	3,750	3	500-5,600	30-40	P.	P.L.-Ref.	52
Attock Punjah:								
Khaur	150	300	4	100-6,000	35-42	P.	P.L.-Ref.	...
Dhulian	15	1,500	3	3,800-7,800	40-45	P.	P.L.-Ref.	3

INDIA-BURMA (Continued)

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet	Age of field (years)
Burma:								
Indaw, Minbu	80	200	..	.....	36-42	M.	P.L.-Ref.	...
Singu	568	9,380	5	1,800-5,000	45	M.	P.L.-Ref.	...
Thayetmyo	...	157	..	600-2,500	45	M.	P.L.-Ref.	...
Upper Chindivin	...	196	..	.....	..	M.	P.L.-Ref.	...
Yenangyat-Lanywa	330	1,962	3	400-4,200	32-60	M.	P.L.-Ref.	...
Yenangyanung	2,900	9,535	6	300-6,000	45	M.	P.L.-Ref.	...
Total India-Burma	4,243	26,980	24					

IRAN

Masjid-Sulaiman	†30	65,000	1	2,500-3,500	37.6	Paraffin	P.L.-Ref.	20
Haft Kel	‡25	140,000	2	4,500-5,000	37.6	Paraffin	P.L.-Ref.	11
White Oil Springs*	3	shut in	1	.....	...	Paraffin	....	6
Gach Saran	7	3,200	2	4,500-6,000	...	Paraffin	....	4
Naft-i-Shah	10	1,800	1	.....	...	Paraffin	Ref.	13
Lali*	0	.....	1	.....	...	Paraffin	....	..
Agha Jari	2	.....	1	5,500-8,810	...	Paraffin	....	..
Pazanun*	0	.....	1	.....	...	Paraffin	....	..
Chia Surkh*	0	.....	1					
Total Iran	75	210,000	11					

*Fields thus identified are in various stages of exploration. †There are in addition about 40 input and observation wells. ‡There are in addition about 15 input and observation wells. Most of Iran's output is produced by the Anglo-Iranian Oil Co., Ltd., under a concession from the Government of Iran. A large part of the crude is refined at the company's plant located at Abadan, Iran, one of the industry's largest and most complete refineries.

IRAQ

Kirkuk	42	75,000	2	2,100-2,200	36	M.	P.L.†	13
Qaiyarah-Najmah:								
Jawan-Qasab—								
Lower Fars zone	3			650	18.2	M.	....	5
Limestone zone	42	*100	4	690	15.8	..	....	13
Pilsner zone	8			1,500	17.0	M.	....	6
Naft Khaneh	‡7	400	1					
Total Iraq	102	75,500	‡9					

*This production is exclusively devoted to fuel and road-oil requirements, some of which is delivered to the government, and credited to rental and royalty payments. †All crude produced by Iraq Petroleum Co., Ltd., and delivered by its pipe-line system to Mediterranean terminals located at Haifa, Palestine, and Tripoli, Syria. ‡Four rigs of this total are engaged in wildcat exploration at various points in British Oilfield Development concessions.

KUWAIT (Persian Gulf)

Burgan	5	Shut in	1	3,500-4,500	34	M.	....	3

'Operations carried on by Kuwait Oil Co., Ltd., (Gulf Oil Corp. and Anglo-Iranian Oil Co., Ltd.).

REPUBLIC OF MEXICO

(Developments as of September 1, 1940)

San Luis Potosi:								
El Limón	16	302	..	1,855-2,750	11.6	A.	P.L.	18
Ebano-Chapacao	99	6,065	5	1,465-2,725	11.6	A.	P.L.-T.C.	36
Tamaulipas:								
Altamira	17	836	8	1,420-2,610	15.7	A.	Tank cars	14
Vera Cruz:								
Alazán	2	249	..	2,000-2,320	22.1	A.-P.	P.L.	28
Alamo-San Isidro	27	606	..	2,095-2,295	24.0	A.-P.	P.L.	27
Cerro Viejo	4	34	..	1,890-2,295	22.8	A.-P.	P.L.	19
Cacalilao	108	3,765	..	1,250-2,575	12.3-12.7	A.-P.	P.L.-T.C.	18
Corcovado	40	1,282	..	1,975-2,750	11.7	A.	P.L.	16
Cuichapa	2	9	..	2,084-2,355	25-26	P.	P.L.	1
El Burro	33	2,401	..	2,445-4,455	27.3	P.	P.L.	9
El Plan	39	8,621	6	1,790-5,745	22.5	P.	P.L.	9
Filisola	44	1,117	..	2,775-3,555	21.5	P.	Tank car	17
Juan Felipe—Moralillo	6	507	..	3,450-3,850	20.9	A.-P.	P.L.	7
Pánuco	112	2,799	5	1,312-2,955	11.7-14.5	A.	P.L.-T.C.	27
Potrero—Horcones	8	461	..	1,815-1,940	21.8	A.-P.	P.L.	30
Poza Rica	29	73,247	3	6,715-8,500	28-34	A.-P.	P.L.	10
San Diego—Chiconcillo	6	133	..	2,140-2,600	20.4-21.4	A.-P.	P.L.	17
South Chinampa—N. Amatlán	26	1,372	..	1,540-2,290	20.4-21-4	A.-P.	P.L.	31
South Amatlán	31	1,582	..	1,810-2,455	20.4-21.4	A.-P.	P.L.	27
Salinas—El Barco—Caracol	19	570	..	2,000-3,150	12.5	A.-P.	P.L.	21
San Sebastian	1	74	..	2,600-3,210	13.1	A.	Tank car	11
Tanhuijo	2	1	..	450-3,220	22.0	A.-P.	Tank car	29
Tepetate—N. Chinampa	10	553	..	1,980-2,400	20.7-21.1	A.-P.	P.L.	25
Toteco—Cerro Azul	41	4,433	..	1,680-2,885	19.9-20.9	A.-P.	P.L.	31
Tierra Blanca—Chapopote Nuñez	20	517	..	1,970-2,310	20.9	A.-P.	P.L.	19
Tierra Amarilla	8	75	..	2,435-2,480	22.7	A.-P.	P.L.	29
Topila	40	735	..	595-3,365	11.5-19.0	A.	P.L.-T.C.	19
Teapa Nuevo	2	5	..	325-1,814	40.6	P.	P.L.	12
Tonalá	81	3,302	..	1,860-3,280	28.7	P.	P.L.	12
Zacamixtle	7	70	..	2,190-2,520	20.5-21.2	A.-P.	P.L.	20
Total México	881	115,723	27					

Data courtesy Petroleos Mexicanos.

Mexico's Gas Fields

	Number of wells	Production cu. ft. daily	Producing depths	Outlet	Age of field (years)
Tamaulipas:					
La Presa	2	255,207	1,535-2,025	Pipe line	9
Rancherias	6	9,918,269	1,270-6,265	Pipe line	7
Mier	4	5,398,565	1,225-2,035	Pipe line	6
Vera Cruz:					
Poza Rica	15	65,677,826	6,715-8,500	Pipe line	10
Tonala	74	2,347,713	1,865-3,280	Pipe line	12
El Burro	31	1,505,249	2,445-4,455	Pipe line	9
El Plan	26	6,560,954	1,790-5,745	Pipe line	9
Filisola	43	318,281	2,770-3,555	Pipe line	17
Cerro Azul-Toteco	33	.....	1,680-2,885	Pipe line	24

NETHERLANDS EAST INDIES

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet*	Age of field (years)
British Borneo:								
Sarawak and Brunei	470	17,400	2	130-5,790	32	M.	Refinery	31
East Borneo:								
Balikpapan and Tarakan	880	33,700	6	210-3,280	18	A.	Refinery	45
Ceram	55	2,000	..	240-1,020	..	M.	Refinery	44
Java	330	16,800	3	130-3,000	..	M.	Refinery	53
South Sumatra:								
Palembang-Djambi	1,350	90,300	25	†130-2,950	37.8	P.	Refinery	44
North Sumatra	170	21,800	5	.....	..	M.	Refinery	55
Total East Indies	3,255	182,000	41					

*A network of pipe lines moves East Indies crude to refining centers on the islands and most of the products are exported to the Far East, Near East, African and European countries. Subsidiaries of the Standard Oil Co. of New Jersey and Royal Dutch-Shell are the principal operating companies.
†Wells in this area have been drilled as deep as 6,300 ft. but production from that depth at present could not be confirmed.

PERU

La Brea-Parinas, Piura	2,058	26,530	28	1,000-3,500	38	M.	Local and export	51
Lobitos and Restin, Piura	796	7,250	16	150-6,500	36	M.	Local and export	37
Zorritos, Tumbes	52	175	3	600-3,000	...	M.	Local and export	57
Pachitea	2	Shut in	..	1,050-1,150	46.4	P.	Ncne	2
Pirin, Dept. of Puno	2	75	2	800	35	M.	Local	22
Total Peru	2,910	34,030	49					

International Petroleum Co., Ltd., largest producer, refines part of its production at Talara, Peru, and moves the remainder by tanker. Lobitos Oilfields, Ltd., has practically all the remaining marketed crude which is transported by tanker to points outside Peru.

POLAND (Now German and Russian)

(G) Lipinki-Libusza (Gorlice)	700	1,500	..	150-2,700	34	Paraffin	P.L.	75
(G) Biecz-Korczyna (Gorlice)	48	85	..	480-1,440	39	Asphalt	P.L.	43
(G) Sekowa-Siary (Gorlice)	114	40	..	450-1,350	35	Asphalt	P.L.	68
(G) Harklowa (Jaslo)	149	145	..	1,065	27	Asphalt	P.L.	70
(G) Roztoki-Sadkowa (Jaslo)	22	35	..	3,000-3,900	40	Asphalt	P.L.	31
(G) Mencinka-Jaszczew	34	125	..	2,400-3,600	42	Paraffin	P.L.	31
(G) Potok-Toroszowka (Krosno)	165	650	..	416-1,120	42	Asphalt	P.L.	49
(G) Krosno-Kroscienko (Krosno)	68	45	..	900-2,000	32	Mixed	P.L.	52
(G) Bobrka-Rogi (Krosno)	96	130	..	480-3,200	34	Mixed	P.L.	82
(G) Wulka-Iwonice	60	80	..	690-2,120	29	Asphalt	P.L.	52
(G) Zmiennica-Turzepole (Brzozow)	43	70	..	1,480-2,400	33	Paraffin	P.L.	44
(G) Humniska, Grabownica (Krosno)	61	250	..	2,300-2,940	47	Mixed	P.L.	44
(G) Weglowka (Krosno)	86	70	..	270-1,050	29	Asphalt	P.L.	53
Total Jaslo district	1,646	3,080						
(R) Tyrawa Solna (Sanok)	15	75	..	300-900	44	Asphalt	P.L.	28
(R) Lipie-Czarne (Lesko)	29	55	..	1,020-1,310	42	Mixed	P.L.	54
(R) Wankowa-Paszowa (Lesko)	390	500	..	1,150-1,900	34	Paraffin	P.L.	54
(R) Strzelbice (Sambor)	40	50	..	660-4,270	32	Paraffin	P.L.	59
(R) Boryslaw (Drohobycz)	610	4,800	..	4,270-5,700	33	Paraffin	P.L.	46
(R) Opaka (Drohobycz)	5	10	..	1,970-80	43	Paraffin	P.L.	44
(R) Schodnica-Urycz (Drohobycz)	595	1,050	..	1,480	36	Mixed	P.L.	80
(R) Daszawa (Drohobycz)	30	gas wells	..	2,300	..	...		19
Total Drohobycz district	1,709	6,540						
(R) Raypne-Perehinsko (Dolina)	130	250	..	2,625	36	Paraffin	P.L.	53
(R) Majdan-Niebylow (Kolomyja)	100	110	..	1,150-1,920	30	Asphalt	P.L.	51
(R) Bitkow (Nadworna)	147	575	..	3,610	44	Paraffin	P.L.	41
(R) Pasieczna (Nadworna)	37	70	..	660-4,700	45	Mixed	P.L.	60
(R) Sloboda-Rungurska (Nadworna)	51	35	..	185-2,400	36	Paraffin	P.L.	65
(R) Kalusz (Kalusz)	2	gas wells	..	2,600	..	...		5
Total Stanislawow district	467	1,040						
Total Poland	3,822	10,660						
Total German	1,646	3,080						
Total Russian	2,176	7,580						

Note: Fields preceded by (G) are now in German territory. Fields preceded by (R) are now in Russian territory.

SAUDI ARABIA

Dammam	15	27,000	3	4,500	35.5	A.	(†)	3
Dammam	3	160	..	2,100	50	A.	(†)	5
Dammam	1 gas	.....	..	2,100	35.5	..	....	1
Abu Hadrya	1	shut in	..	10,220	...	..	....	..
Ma'agala	..	suspended	1	.....	...	..	....	..
*Total Saudi Arabia	20	27,160	4					

*Produced and marketed by California Arabian Standard Oil Co. (Standard of California). †Pipe line to Ras Tanura, Saudi Arabia, sea terminal.

RUMANIA

Name of field and location—	Producing wells	Daily av. prod. (bbl.)	Wells drilling	Producing depths	Gravity A.P.I.	Base of crude	Outlet	Age of field (years)
Moreni, Prahova District	284	12,200	9	1,000-5,600	33	M.	P.L.	37
Piscuri, Prahova	120	7,085	4	1,200-4,000	33	M.	P.L.	13
Margineni, Prahova	15	2,835	4	6,100-7,500	39	P.	P.L.	5
Aricesti, Prahova	10	425	..	5,500,7,400	35	P.	P.L.	19
Tintea, Prahova	95	26,035	20	600-8,800	39	M.	P.L.	79
Baicoi, Prahova	45	1,835	1	600-8,800	39	M.	P.L.	79
Lilesti, Prahova	8	1,285	5	600-8,800	39	M.	P.L.	79
Boldesti, Prahova	102	13,290	1	6,900-7,900	37	P.	P.L.	18
Ceptura, Prahova	136	12,080	2	2,400-4,100	34	P.	P.L.	27
Runcu Bustenari, Prahova	148	1,670	11	100-2,500	42	P.	P.L.	96
Chiciura-Bustenari-Bordeni, Prahova	445	2,160	18	100-2,500	42	P.	P.L.	96
Campina	63	555	..	700-1,200	41	P.	P.L.	56
Gura Draganesei-Pitigaia	3	30	..	1,100-4,200	38	P.	P.L.	60
Copaceni	7	65	..	700-2,200	41	P.	P.L.	36
Scaiosi	3	5	1	1,450-1,800	40	P.	P.L.	11
Total Prahova	1,486	81,555	76					
Gura-Ocnitei, Dambovita	335	22,735	12	5,400-5,900	33	P.	P.L.	11
Rasvad, Dambovita	40	4,790	..	600-1,400	38	P.	P.L.	84
Bucsani, Dambovita	85	5,290	5	6,500-7,300	38	P.	P.L.	7
Ochiuri, Dambovita	91	5,190	3	1,300-4,000	33	M	P.L.	27
Teis-Aninoasa, Dambovita	13	810	2	500-1,000	37	P.	P.L.	..
Viforata, Dambovita	11	320	1	600-1,900	38	P.	P.L.	..
Glodeni, Dambovita	6	5	..	1,000-2,000	39	P.	P.L.	43
Doicesti, Dambovita	...	.....	1	1,700-1,900	39	P.	P.L.	28
Total Dambovita	460	39,140	24					
Arbanasi, Buzau	85	740	1	200-1,000	38	P.	P.L.	71
Solont, Stanesti, Zemes, Taslau, Moinesti, Lucacesti, Comanesti, Grozesti, Tetcani, Casin Bacau District	177	865	2	200-2,200	43	P.	P.L.	68
Total Bacau District	262	1,605	3					
Total Rumania	2,208	122,300	103					

TRINIDAD

				1,688-4,419	....	..	....	29
Point Fortin	..	6,309	5	90-5,602	18-27	A.	....	32
Guapo Pool	..	880	..	.....	....	..	....	..
Vessigny	..	633	1	.....	....	..	....	..
Brighton	..	53	..	100-3,622	13-25	A.	....	32
Tabaquite	..	29	..	300- 500	42	P.	....	20
Lizard Springs	..	3	..	.....	....	..	....	..
Palo Seco	..	5,636	3	100-5,373	21-43	A.	....	30
Coora	..	3,226	2	.....	....	..	....	..
Point Liqoure	..	27	..	.....	....	..	....	..
Fyzabad-San Francique	..	26,862	1	100-5,402	15-40	A.	....	26
Penal	..	1,535	1	650-4,656	....	..	....	..
Guayaguayare	..	194	2	580-4,600	....	..	....	38
Barrackpore	..	484	..	500-2,000	17-38	A.	....	29
Cedros	..	.....	1	.....	....	..	....	30
Total Trinidad	..	52,779	19					

Figures on wells not available. Short pipe lines and refineries handle all crude.

U.S.S.R.

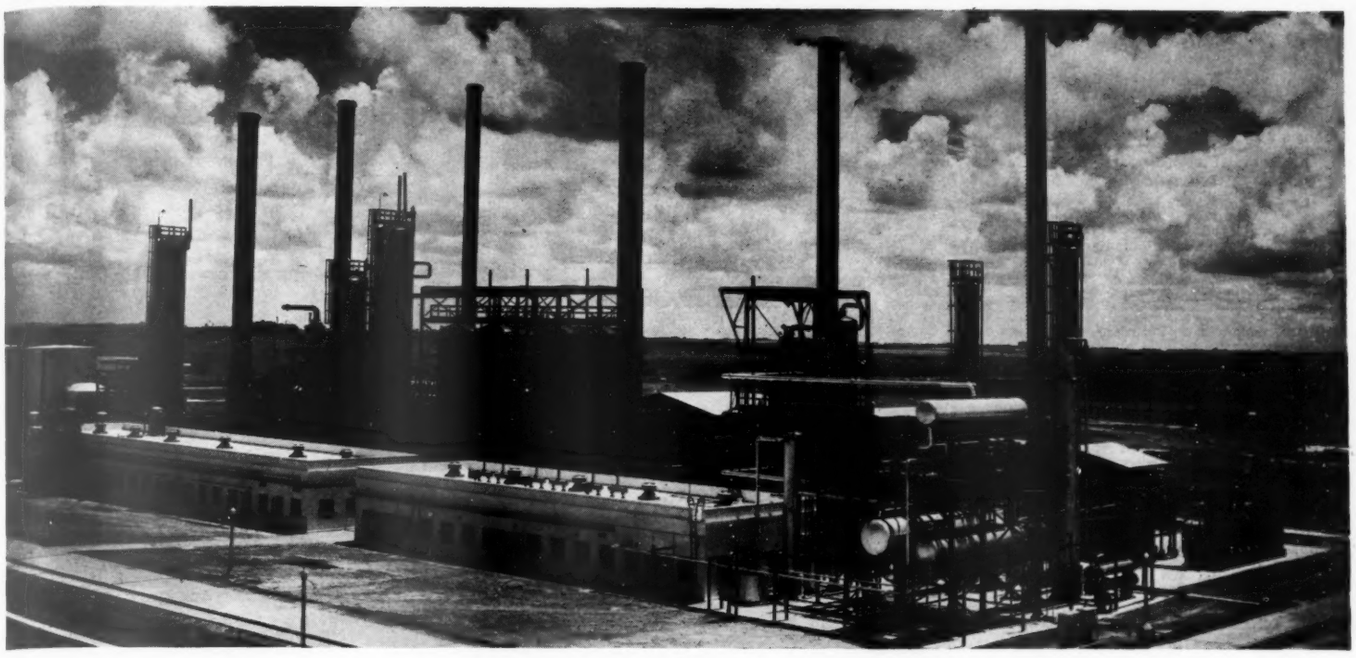
Up-to-date and complete information on operations not available. Special article in this issue (see index) discusses operating conditions.

VENEZUELA

Lagunillas (State of Zulia)	1,016	178,379	5	2,270-4,900	17.3	A	Tankers	15
Cabimas (State of Zulia), includes Ambrosio, La Rosa, and Punta Benitez	815	58,748	1	800-2,800	25.4	A	Tankers	24
Tia Juana (State of Zulia)	401	105,485	1	1,900-3,100	13.5	A	Tankers	13
Bachaquero (State of Zulia)	20	4,439	2	3,150-5,160	14.8	A	Tankers	11
La Concepcion (State of Zulia)	75	2,342	..	950-3,800	36.0	M	P.L.-Tankers	16
La Paz (State of Zulia)	24	1,285	..	950-3,800	20.3	M	P.L.-Tankers	16
Mene Grande (State of Zulia)	179	29,453	2	450-5,000	20.3	A	P.L.-Tankers	27
El Cubo (State of Zulia)	72	17,537	3	800-4,500	32.3	M	P.L.-Tankers	11
Cumarebo (State of Falcon)	51	5,341	..	650-1,500	48.7	P	P.L.-Tankers	10
Mene Mauroa (State of Falcon)	66	917	..	750-3,000	34.6	M	P.L.-Tankers	13
Hombre Pintado (State of Falcon)	18	1,827	2	750-3,000	25.0	M	P.L.-Tankers	13
Quiriquire (State of Monagas)	176	61,317	..	2,600-3,100	19.6	A	P.L.-Tankers	11
Pedernales (Delta Amacuro)	8	5,008	..	5,000-6,000	21.5	A	P.L.-Tankers	5
Temblador (State of Monagas)	54	10,797	..	3,500-4,000	21.5	A-M	P.L.-Tankers	4
Oficina (State of Anzoategui)	57	35,583	11	3,900-6,300	30.2	M	P.L.-Tankers	4
Santa Ana (State of Anzoategui)	2	238	..	7,000-7,500	52.7	M	P.L.-Tankers	2
Jusepin (State of Monagas)	39	11,476	..	4,150-5,150	32.7	M	P.L.-Tankers	2
San Joaquin (State of Anzoategui)	4	2,288	4	6,000-6,700	46.2	M	P.L.-Tankers	2
El Roble (State of Anzoategui), 5 months	2	1,987	1	8,000-9,500	43.4	P	P.L.-Tankers	2
Others	7	117	8	.....	.....	..	.....	..
Total Venezuela	3,086	534,564	40	.....	.....	..	.....	..

Average number of wells actually producing during first 8 months of 1940. Does not include wells closed in, workover, and similar operations. Average production during first 8 months of 1940. Total drilling wells as of August 31, 1940.

The principal producing companies in Venezuela are subsidiaries of the Royal Dutch-Shell (Venezuela Oil Concessions, Caribbean Petroleum Co., and Colon Development Co., Ltd.) and the Standard Oil Co. of New Jersey (Creole Petroleum Corp. through Standard Oil Co. of Venezuela and Lago Petroleum Corp.). Most of the Standard of New Jersey production is refined at a large plant of a subsidiary unit—Lago Oil & Transport Co., Ltd.—located on Aruba Island, N. W. I., and that of the Shell units at the large refinery of C. P. I. M. (Shell) located on the island of Curacao, N. W. I. The third largest producing company in Venezuela is the Mene Grande Oil Co. (Gulf Oil Corp.) and its output is marketed by that company. The British Controlled Oilfields, Ltd., is the fourth largest producing company and markets its own output. The four principal producing units have refineries located in Venezuela.



View of Y. P. F. combination unit at Campana, Argentina, which has a capacity of 2,000 bbl. of crude daily

World Oil-Refineries Survey

Company and address—	Location of plant	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
ARGENTINA							
Compania Argentina de Petroleo, S. A., "Astra," Av. Leandro N-Alem 621, Buenos Aires	Comodoro Rivadavia	.....	2,200	S	None	None	Op.
Compania Ferrocarrilera de Petroleo, Peso Colon 185, Buenos Aires	Comodoro Rivadavia	C. Hargreaves	6,300	S-C	2,000	Cross	Op.
Cia. Nativa de Petroleos, Av. Roque Saenz Pena 567, Buenos Aires	Campana	W. J. Connelly	16,000	S-C	8,900	Link Tube & Tank	Op
Cia. Nativa de Petroleos, Av. Roque Saenz Pena 567, Buenos Aires	Bahia Blanca	C. B. Luikart	2,000	S-C	1,500	Cross	Op.
Diadema Argentina S.A. de Petroleo (Shell), Av. Roque Saenz Pena 788, Buenos Aires	Buenos Aires	J. Ph. van Goethem	12,580	S-C	14,400	Dubbs	Op.
Cia. El Condor, Levalle 27, Avellaneda	Avellaneda, Buenos Aires	M. Morales	500	S-L	None	None	Op.
Cia. "La Isaura," S.A., Av. Roque Saenz Pena 699, Buenos Aires	Bahia Blanca	W. Fergusson	2,200	S-C	850	Dubbs	Op.
Cia. Ultramar, S.A. Petroleo Argentina, Calle Chile 778, Buenos Aires	Buenos Aires	.....	4,400	Comp.	2,600	deFlorez	Op.
Standard Oil Co., S.A., Argentina, Av. Roque Saenz Pena 567, Buenos Aires	Embarcacion	G. Gaensbauer	1,000	S	None	None	Op.
Standard Oil Co., S.A., Argentina, Av. Roque Saenz Pena 567, Buenos Aires	Plaza Huincul	.....	250	S	None	None	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	La Plata	Dr. A. Zanetta	31,450	Comp.	21,400	Cross-Alco	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	San Lorenzo	Dr. J. Canessa	9,500	S-C	7,550	Gyro-Olco	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Compana	Leslie J. Hudson	2,200	S-C	1,000	Cross	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Godoy Cruz	Fermo Monti	650	S	None	None	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Vespucio	Rafael Llabres	500	S	None	None	Op.
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	Plaza Huincul	Herminio Gioia	1,575	S	None	None	Op.
Lottero, Papini Cia., Buenos Aires	Avellaneda, B.A.	.....	575	S-L	None	None	Op.
Ramon Goreleri and Cia., Buenos Aires	Quilmes, B.A.	.....	150	S-L	None	None	Op.
Cia. General Asfaltos, Buenos Aires	Wilde, F.C.S., Buenos Aires	.....	200	S-L	None	None	Op.
Total Argentina			94,230		60,100		
AUSTRALIA							
Commonwealth Oil Refineries, Ltd. (Anglo-Iranian), Scottish House, 90 William St., Melbourne	Laverton, near Williamston	G. F. McKillop	2,000	S	None	None	Op.
Newport Oil Refinery, Ltd., Melbourne	Newport	G. Turner	100	L	None	None	Op.
Shell Co. of Australia, Ltd., Bourke and William Sts., Melbourne	Clyde, N.S.W.	V. S. Smith	2,000	S-C	1,000		Op.
Total Australia			4,100		1,000		
BAHREIN ISLAND							
Bahrein Petroleum Co., 135 East Forty-second St., New York	Bahrein I., Persian G.	.....	32,500	S-C	12,000	Dubbs	Op.
Total Bahrein Island			32,500		12,000		
BELGIUM							
Belgian Cracking Co., S.A., 31 rue de la Science, Brussels	Langerbrugge	C. Razvan-Penescu	500	S-C	300	Dubbs	Op.
Belgo Petroleum Co., Terdonck	Terdonck	P. D'Hoker	1,200	S-C	1,000	Jenkins	Op.
Compagnie Industrielle Atlas S.A. Belge, 101 Avenue de France, Antwerp	Antwerp	L. Van Hertbruggen	1,500	S	None	None	Op.
Raffinerie Belge de Petroles, 115 Avenue de France, Antwerp	Antwerp	G. Henen	3,800	S-C	1,000	Jenkins	Op.
Raffineries et Distilleries Anversoises, Place Leopold 10, Antwerp	Antwerp	O. Mathey	2,000	S	None	None	Op.
Redeventza Societe Anon. Belge, Rive de l'Escaut, Antwerp-Kiel	Antwerp-Kiel	Dr. F. Kind	3,000	S-C	1,000		Op.
Societe Chimiquede Selzaete, 29 rue Ducale, Brussels	Selzaete	Addison Leonard	175	S	None	None	S.D
Total Belgium			12,175		2,300		
BELGIAN CONGO							
Compagnie Financiere Belge des Petroles (Petrofina), 4 rue Wappers, Antwerp	Leopoldville	L. Wolters	250	S-C	150	Carburol	Op.
Total Belgian Congo			250		150		
BOLIVIA							
Yacimiento Petroliferos Fiscales Bolivia, Calle Reves Ortiz 69, La Paz	Sanadita	G. J. Elder	375	S	None	None	Op.
Yacimiento Petroliferos Fiscales Bolivia, La Paz	Camira	G. J. Elder	350	S	None	None	Op.
Total Bolivia			725				

Both above refineries built by Standard Oil Co. of Bolivia.

NOTE: War censorship interfered with obtaining 1940 information on a few countries.

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
BRAZIL							
Industrias Matarazzo de Energia S.A. "IME," Predio Conde Matarazzo, Sao Paulo	Sao Caetano	Dr. Oswald Fernandez Rinando	2,500	S	None	None	Op.
Ipiranga, S.A. Companhia Brasileira de Petroleos, Saco de Mangueira, sem numero, P.O. Box 56, Rio Grande	Rio Grande	Tomaz Pais Cunha	1,800	S	None	None	Op.
Standard Oil Co. of Brazil, Caixa do Correlo 970, Rio de Janeiro	Sao Paulo	.....	2,160	S	None	None	S.D.
Total Brazil			6,460				
CANADA							
Detailed information on Canadian refineries appeared in the March 28, 1940, issue of The Oil and Gas Journal. Total of 54 refineries have capacity estimated November 1, 1940, at			221,850	.....	87,500		Op.
CANARY ISLANDS (Spain)							
Compania Espanola de Petroleos, S.A., Plaza de las Cortes 3, Madrid	Santa Cruz de Teneriffe	J. Lliso	5,000	S-C	4,100	Dubbs	Op.
Total Canary Islands			5,000		4,100		
CHILE							
Cia. de Salitre, Y.F.C. de Agua Santa, Iquique	Iquique	.....	300	S	None	None	Op.
Soc. Establecimentos Fuimicos, Ave. San Martin 1499, de Vina Del Mar, Vina Del Mar	Del Mar	.....	175	S	None	None	Op.
Maritano, Miguel, Calle Colon No. 849, Talcahuano	Talcahuano	.....	60	S	None	None	Op.
Total Chile			535				
COLOMBIA							
Tropical Oil Co., Apt. 170, via Cartagena, El Centro	Barranca Bermeja	W. E. Longwortht	14,000	S	None	None	Op.
Colombian Petroleum Co., 135 East Forty-second St., New York	Petrolea	.....	500	S	None	None	Op.
Total Colombia			14,500				
CUBA							
Standard Oil Co. of Cuba, Apartado 1303, Havana	Belot	F. B. Preston	4,200	S-C-L-A	2,100	Tube & Tank	Op.
DENMARK							
Dansk Mineralolie fabrik, A.S., 5-15 Copenhagen	Copenhagen	.....	500	S	None	None	Op.
ECUADOR							
Anglo-Equadorian Oilfields, Ltd., 146 Dashwood House, Old Broad St., E.C. 2, London, England	La Libertad	L. W. Berry	2,200	S	None	None	Op.
Ecuador Oilfields, Ltd., River Plate House, Finsbury Circus, E.C. 2, London, England	Cuativo	.....	100	S	None	None	Op.
Refinery Viggiani, Salinas	Carolina	.....	50	S	None	None	Op.
Total Ecuador			7,350				
EIRE							
Irish National Refineries, Ltd., 11 Stephens Green, C. 2, N. Dublin; 9 St. Helen's Place, E.C. 2, London	Dublin	E. L. Lomax	10,000	S-L	None	None	Prop.
Cork Harbour Oil Wharves, Ltd., 22 Orchard St., W. 1, London, Eng.	Haulbowline	J. H. Varley	600	.....	None	None	Op.
Total Ireland			10,600				
ESTONIA*							
A.G. Kivoli	.....	.....	500	.....	....	.....	Op.
Three others	.....	.....	500	.....	....	.....	Op.
Total Estonia			1,000				
*Refineries operate on shale oil.							
EGYPT							
Anglo-Egyptian Oilfields, Ltd., St. Helen's Court, Great St. Helen's E.C. 3, London, England	Suez		15,000	S-C-A	4,100	Dubbs	Op.
Raffinerie de Petrole du Government, 18 Rue Fouad ler Alexandria	Suez	A. H. Defrawi Eff	2,000	S	None	None	Op.
Total Egypt			17,000		4,100		
FRANCE							
Compagnie Francaise de Raffinage, 11 Rue du Docteur Lancereaux, Paris (8)	Gonfreville	R. Perrin	36,000	Comp.	8,800	Cross	Op.
Compagnie Francaise de Raffinage, 11 Rue du Docteur Lancereaux, Paris (8)	Martigues	R. Perrin	20,000	S-C	5,900	Cross	Op.
Compagnie Industrielle des Petroles, S.A.F., 54 Rue de Londres, Paris	Frontignan-Sete	P. Gueret-Bellemare	5,000	Comp.	3,200	Kellogg	Op.
Raffineries de la Vacuum Oil Co., S.A.F., 46 Rue de Courcelles, Paris	Gravenchon	.....	6,000	L-W-A	2,300	Kellogg	Op.
Compagnie des Produits Chimiques et Raffineries de Berre, 55 Rue d'Amsterdam, Paris (8)	Berre	.....	10,000	Comp.	4,500-6,500	Houdry	Op.
Les Propetrol Consommateurs de Petrole, Paris	Donges	.....	3,500	S	None	None	Op.
Pechelbronn Societe Anonyme d'Exploitations Minieres, 32 Allee de la Robert sau, Strasbourg	Merkwiller-Pechelbronn	A. Pellisier	2,500	S-C	1,000	Winkler-Koch	Op.
Pechelbronn-Ouest, Soc. Anon. (subsidiary of above), 4 Rue Roussel, Paris	Donges	A. Rimailho	5,000	S	None	None	Op.
Brest Port Petrolier (subsidiary of Pechelbronn Soc. Anon.), 4 Rue Roussel, Paris	Brest	A. Pellisier	2,000	S	None	None	Op.
Raffinerie de Petrole du Nord, 19 Rue du General Foy, Paris, 8e	Dunkirk	R. Francois	10,000	S-C	2,000	Winkler-Koch	Op.
Raffineries de la Vacuum Oil Co., S.A.F., 46 Rue de Courcelles, Paris	Port Jerome	.....	6,500	S-C	2,300	Kellogg	Op.
Societe Anon. des Petroles Jupiter (Shell), 42 Rue Washington, Paris, 8	Pauillac	J. Vidal	10,000	S-C	7,000	Dubbs	Op.
Societe Anon. des Petroles Jupiter, 42 Rue Washington, Paris, 8	Rouen	J. Vidal	15,000	S-C	7,000	Dubbs	Op.
Societe Lyonnaise de Schistes Bituminex (Shale), 21 Rue de Paris, Paris	Autun	M. Boulzaguet	750	S-C	400	Dubbs	Op.
Societe de Raffinage des Huiles de Petrole (subsidiary of Anglo-Iranian), 19-21 Rue de la Bienfaisance, Paris, 8e	Courcheletts	F. Gilabert	5,000	S-C	2,000	Cross	Op.
Societe de Raffinage des Huiles, 19-21 Rue de la Bienfaisance, Paris, 8e	L'Avera	F. Gilabert	8,000	S-C	3,000	Cross	Op.
Societe des Raffineries de Petrole de la Gironde (Texas Co. interested), No. 7 Place Vendome, Paris	Bordeaux	.....	6,300	S-C	5,000	Dubbs and Cross	Op.
Standard Francaise des Petroles S.A., 82 Ave. des Champs Elysees, Paris	Port Jerome	R. B. Young	24,000	S-C-L-A	12,000	Tube & Tank	Op.
Standard Francaise des Petroles, 82 Ave. des Champs Elysees, Paris	La Mailleraye	L. Delemar	Reduced crude operation				Op.
Total France			151,550		72,900		
GERMANY (Bohemia-Moravia)							
Apollo Mineraloel Raffinerie, A.G., Culenova ul 3, Bratislava	Regenszurg	.....	1,800	S-C	1,100	Dubbs	Op.
Apollo Mineraloel, Culenova ul 3, Bratislava	Welkersdorf	.....	400	S	None	None	Op.
Fanto-Werke Aktien-Gesellschaft, Jozsef-ter 3-4, Budapest, 5	Pardubice	L. Fenyes	4,000	S	None	None	Op.
Fanto-Werke, Jozsef-ter 3-4, Budapest, 5	Bohumin	L. Fenyes	1,500	S	None	None	Op.
Himmelbauer, Anton & Co., Moravska Ostrava	Moravska Ostrava	.....	500	S-W	None	None	Op.
Kralupska Raffinerie Mineralnich Oleju, Hybernska 44, Prague, 2	Kralupy	.....	750	S	None	None	Op.
Prara Hornovididiecka Raffinerie Petroleza Ehrenburg & Co., Strazske	Strazske	.....	100	L-W	None	None	Op.
Privozer Mineraloelwerke, A.G. Nor., Moravska-Ostrava	Nor. Ostrava-Privoz	.....	1,250	S	None	None	Op.
Sudkarpatische Mineralol Raffinerie und Handels, A.G., Mukacevo	Mukacevo	.....	100	L-W	None	None	Op.
Vacuum Oil Co., S.A., Spalena 3, Prague	Kolin, Bohemia	.....	1,800	S	None	None	Op.
Weinberger & Ortner, Doine Mihalany, Zemplin	Doine Mihalany	.....	100	L-W	None	None	Op.
Total Bohemia-Moravia			12,300		1,100		

GERMANY
(Austria)

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
Creditul Minier Oesterreichische-Rumanische, Petroleum-Vertriebs-Gesellschaft, Bulevardul Bratianu 16, Bucarest	Korneuburg	C. Stoicescu	2,400	S	None	None	Op.
Creditul Minier Oesterreichische-Rumanische, Petroleum-Vertriebs-Gesellschaft, Bulevardul Bratianu 16, Bucarest	Droesing	C. Stoicescu	1,000	S	None	None	Op.
Oesterreichische Fanto, A.G., Herrengasse 17, Vienna	Lanzendorf	.....	1,120	S	None	None	Op.
Aktiengesellschaft der Shell-Floridsdorfer-Mineralolfabrik, Schubert-ing 14, Vienna, 1	Floridsdorfer	.....	2,000	S-C	750	....	Op.
Vacuum Oil Co., A.G. (Vienna), Schwarzenbergplatz 18, Vienna	Kagran	Otto Griffa	1,500	S	None	None	Op.
Total Austria			8,020		750		

GERMANY
(Old Reich)

Danubia A.G. Fur Mineraloel-Industrie, Wiener Str. 18, Regensburg	Regensburg	.....	500	S	None	None	Op.
Deutsche Erdol Raffinerie A.G., Martin Lutherstrasse 61-66, Berlin	Misburg	.....	5,000	S-C	2,500	Dubbs	Op.
Deutsche Gasolin A.G., Adolph Hitlerplatz 7-11, Berlin	Emmerich	.....	1,200	S	None	None	Op.
Deutsche Gasolin A.G., Adolph Hitlerplatz 7-11, Berlin	Dollbergen	.....	800	S	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Hamburg	E. Baver	1,200	S	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Hannover	K. Grosse	300	S	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Rheinau	M. Heyne	150	L	None	None	Op.
Deutsche Petroleum Aktiengesellschaft, Martin Lutherstrasse 61-66, Berlin	Regensburg	Dr. H. Hase	500	S	None	None	Op.
Deutsche Vacuum Oel, A.G., Semperhaus B, Spitalerstrasse 10, Bremen	Bremen	Dr. W. Knudsen	1,000	S	None	None	Op.
Ebano Asphalt-werke A.G., Neuer Jungfernstieg 21, Hamburg, 36	Harburg	Dr. D. Lohmann	8,000	S-A	None	None	Op.
Wintershall, A.G., Hohenzollernstr., 139, Kassel	Durchsatz	.....	1,000	S	None	None	Op.
"N.I.T.A.G." Internationale Tiefbohr A.G.	Petroleumhafen	.....	8,000	S-C	2,500	Winkler-Koch	Op.
Loeb, Max, Benzin-Benzole-Mineralolwerke, Koln-Braunsfeld, Koln Braunsfeld	Koln-Braunsfeld	.....	200	S-L	None	None	Op.
Mineraloiel und Asphaltwerke A.G., Jungfernsteig 7, Hamburg, 36	Ostermoor	W. Bove	2,500	S	None	None	Op.
Norddeutsche Mineraol A.G., Hannover	Dollbergen	.....	200	S	None	None	Op.
Oelwerke Julius Schindler, G.m.b.h., Hohe Bleichen 28, Hamburg, 36	Neuhof, Peine	C. W. Buente-K. Albrecht	700	S	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Monheim	Dr. W. Kruspig	2,000	S-L	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Hamburg-Grasbrook	Dr. W. Kruspig	2,000	S-L	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Harburg-Wilhelmsb'g	Dr. W. Kruspig	5,000	S-L-A	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Harburg-Wilhelmsb'g	Dr. W. Kruspig	1,200	S	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Reisholz-Dusseldorf	Dr. W. Kruspig	1,200	S	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Freital-Dresden	Dr. W. Kruspig	200	L	None	None	Op.
Rhenania-Ossag Mineralolwerke A.G., Shell-Haus, Alster-Ufer 4-5, Hamburg, 36	Regensberg	Dr. W. Kruspig	300	S	None	None	Op.
Schliemann's Ernest Oelwerke, Gesellschaft, Mit Beschrankter Haftung, Catharinestr., 38-39, Hamburg	Wilhelmsburg	.....	100	L	None	None	Op.
Schliemann's Ernest Oelwerke, Gesellschaft, Mit Beschrankter Haftung, Catharinestr., 38-39, Hamburg	Hamburg	.....	300	S-L	None	None	Op.
Westfalische Mineraloel und Asphalt-werke, Lange Reihe 43, Dortmund	Dortmund-Sud	.....	300	S-L	None	None	Op.
Mineraloél-Raffinerie Vorm, August Korff, Stephanikirchenweide 20, Bremen	Bremen	.....	500	L	None	None	Op.
Mineraloelwerke Lichtenberg, G.m.b.h., Komm-Ges., Jagerstr. 61, Berlin, W.8	Lichtenberg	.....	1,000	S-C	250	.....	Op.
Ruhrbenzol, G.m.b.h., Herner Str. 234, Bocum	Holten	.....	2,000	S-C	820	Dubbs	Op.
Zeller & Gmelin, Fislinger	Eislingen	.....	100	S-A	None	None	Op.
Twelve miscellaneous specialty and small topping plants	.....	.....	1,500	S	None	None	Op.
Total Old Reich			48,450		6,070		

HUNGARY

Hazai Koolajipar Reszvemutarsasag 5, Nadorutca 7, Budapest	Budapest	Geza Komlos	1,000	S-L	None	None	Op.
Nyirbogdanyi Petroleumgyar Reszvemtargsgsag, Andrassy-ut 2, Budapest, 6	Nyirbogdany	Laszlo Barta	300	S-L	None	None	Op.
Shell Koolaj Reszvemutarsasag 5, 5/6 Jozsef nador ter, Budapest	Budapest-Csepel	A. J. Madlener	3,850	S-L	None	None	Op.
Fanto Associated Hungarian Oil Co., Ltd., 3/4 Jozsef nador ter, Budapest 5	Budapest	.....	1,100	S-L	None	None	Op.
Vacuum Oil Co. R.T., V. Zrinyi-ucca 7, Budapest, 5	Fuzito	Alexander Schwarz	3,800	L-W-A	None	None	Op.
Magyar Hydrobenzin Reszuenytarsasag, D. Nador-Utca, Budapest	Petfurdo	.....	1,200	S-C	350	Dubbs	Op.
Szoreger Petroleumfabrik A.G.	Szoreg	.....	420	S	None	None	Op.
Total Hungary			11,670		350		

INDIA

Assam Oil Co., Ltd., Brittanic House, Finsbury Circus, E.C. 2, London, England	Digboi	.....	6,000	S-C	2,100	Dubbs	Op.
Attock Oil Co., Ltd., 6 Fenchurch Ave., E.C. 3, London, England	Rawalpindi	E. S. Millar	4,000	S-C	2,500	Dubbs	Op.
British Burmah Petroleum Co., Ltd., 5 and 6 Queen St. Place, E.C. 4, London, England	Rangoon	.....	2,500	S-C	2,000	Cross	Op.
Burmah Oil Co., Ltd., 175 West George Street, Glasgow, Scotland	Rangoon	.....	20,000	S-C	3,000	Dubbs	Op.
Indo-Burma Petroleum Co., Ltd., 622 Merchant St. (Box 1059), Rangoon	Seikgri	H. Roper	3,500	S-C	1,000	.....	Op.
Indo-Burma Petroleum Co., Ltd., 622 Merchant St. (Box 1059), Rangoon	Kindat	H. Roper	500	S	None	None	Op.
United Refineries, Ltd.	Thilwa	.....	500	S	None	None	Op.
Total India (British India-Burma)			37,000		10,600		

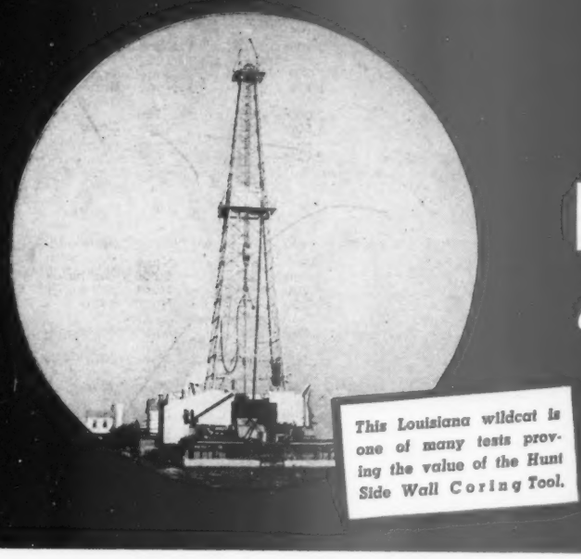
IRAN

Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus. E.C. 2, London, England	Abadan	J. M. Pattinson	280,000	Comp.	125,000	Cross	Op.
Kermanshah Petroleum Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Kermanshah	.....	3,000	S	None	None	Op.
Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Bandar Shapur	.....	50,000	S-C	30,000	.....	Op.
Total Iran			333,000		155,000		

IRAQ

Iraq Petroleum Co., Ltd., City Gate House, Finsbury Circus, E.C. 2, London, England	Baba Gurgur	A. J. Pirks	1,500	S	None	None	Op.
Iraq Petroleum Co., Ltd., City Gate House, Finsbury Circus, E.C. 2, London, England	Kirkuk	.....	*100,000	.....	None	None	Op.
Khanaquin Oil Co., Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Aldwan	J. Startup	2,500	S	None	None	Op.
Total Iraq (exclusive of stabilization plant)			4,000				

*This is a stabilization plant particularly designed to remove the H_2S.



This Louisiana wildcat is one of many tests proving the value of the Hunt Side Wall Coring Tool.

HUNT SIDE WALL CORING TOOL

Averaged 95% Recovery

Almost perfect recovery from 12,000 feet! That's how the Hunt Side Wall Coring Tool performed on this deep coastal Louisiana wildcat. Pressure drilling operations on this hole made conventional coring methods hazardous, so the operator chose to drill ahead from 1,494 feet to 12,019 feet without coring. The hole was then electrically logged and all possibly productive formations were side wall cored. A total of 11 side wall cores were taken from depths ranging from 11,000 to 12,000 feet. Recovery averaged approximately 95%.

The Hunt Side Wall Coring Tool is extremely simple in design and operation as illustrated in the figures at right. It is run in the hole on drill pipe and any desired number of cores are taken by means of a retractable barrel and wire line overshot. Cores range in size up to 1¾" diameter by 6" long. A bit on the lower end of the tool permits drilling out bridges when necessary. A circulation plug may be dropped into the tool if desired so that circulation may be maintained to the bit.

Figure 1, **at right, shows position of core tube after it is seated in the tool and before the side wall core has been taken. Lowering the drilling string slightly forces the deflected core tube into formation, as illustrated in *Figure 2*. Upward movement of the drilling string returns the core tube to its original position. The entire core tube is then retracted by means of a wire line overshot.**

Available in U. S. Fields on A Service Basis—Sold for Export.

Write for Descriptive Folder.

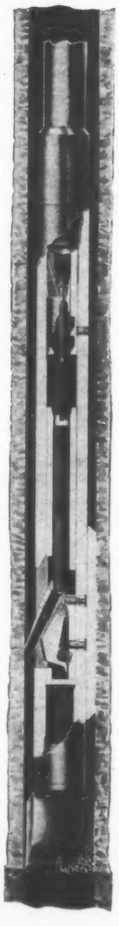


FIG. 1

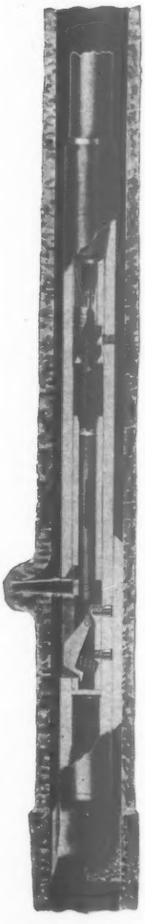


FIG. 2

HUNT TOOL COMPANY

Licensed under U. S. Patents 1683642, 1815661, 2176375. Other Patents pending.

HUNT TOOL COMPANY

HOUSTON, TEXAS, U. S. A.

Company and address—	Plant location	Superintendent	Crude capacity (bbl. div.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
ITALY							
"Aquila" S.A. Tecnico-Industriale, Casella Postale 82, Trieste	Trieste	Dott. S. Albonetti	6,000	S-L	None	None	Op.
Azienda Generale Italiana Petroli, Via Tritone 181, Rome	Venice	E Carafa d'Andria	14,000	S-C	3,100	Dubbs	Op.
Distillazione Italiana Combustibili S.A., San Polo—2004, Venice	Porto Maghera	Dr. Giorgio	5,000	S-C	3,500	Dubbs	Op.
Raffineria di Olii Minerili (A.G.I.P.), C. Vittorio Emanuele 18, Fiume	Fiume	Ing. Felice Epstein	2,500	S-L-W	None	None	Op.
Raffineria de Napoli S.A.I. (Socony-Vacuum), Via Vittorio Veneto 7, Rome	Naples	F. Terrizzani	5,500	S-C	4,000	Houdry-Dubbs	Op.
Societa Petrolifera Italiana, Fornovo Taro (Parma) Italy, Rome	Fornova	.....	1,000	S	None	None	Op.
Standard Societa Italo Americana pel Petrolio, 40 Via Assarotti, Genoa	Trieste S. Sabba	.....	2,500	S-L-A	None	None	Op.
Societa per Industria Italiana del Petrolio (subsidiary of Nafta Societa Italiana del Petroleio ed Affini), Piazza della Vittoria, Genoa	Spezia	A. de Graan	12,000	S-C	4,000	Dubbs	Op.
Azienda Nazionale Idrogenazione Combustibili, Via Principe Umberto 20, Milan A.N.I.C.	Bari	O. Jacobini	4,400	S-C-W-A	7,000	Hydrogenation	Op.
	Leghorn	O. Jacobini	4,400	S-C-W-A	7,000	Hydrogenation	Op.
Total Italy			57,300		28,600		
JAPAN							
Aikoku Oil Co., Kawasaki, Kanagawa	Kawasaki	.....	2,000	S-C	1,000	.....	Op.
Asahi Sekiyu Kabushiki Kaisha (Asahi Petroleum Co., Ltd.), No. 6 Itchome, Marunouchi, Kojimachi-Ku, Tokyo	Tokyo	Tsutomu Ito	500	S	None	None	Op.
Asahi Sekiyu Kabushiki Kaisha (Asahi Petroleum Co., Ltd.), No. 6 Itchome, Marunouchi, Kojimachi-Ku, Tokyo	Hikoshima, Yamaguchi	Makoto Nishinomiya	500	S	None	None	Op.
Hayama Oil Co., Marunouchi 2-chome 16, Tokyo	Kawasaki Kudamatsu	Sansuke Tamanoi	2,000	S-C	1,000	.....	Op.
Imperial Japanese Navy			3,000	S-C	1,500	.....	Op.
Chosen Sekiyu Kaisha, Genzan, Korea	Genzan	.....	5,000	Comp.	1,250	Cross	Op.
Mitsubishi Oil Co., Ltd., Yaesu Building, Marunouchi, Tokyo	Kawasaki	.....					
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Amagasaki	C. T. Tsunoda	5,000	S-C	4,000	Cross	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Kashiwazaki	Ryoichi Nishikawa	4,000	S-C	1,500	.....	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Niigata	Tadao Ohno	2,800	S	None	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Akita	Seiji Magami	2,800	S-C	1,000	Cross	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Tsurumi, Kanagawa	Yonetaro Oka	4,000	S	None	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Kudamatsu, Yamaguchi	Kan Kimura	6,000	Comp.	1,000	Dubbs	Op.
		Dokichi Nakamori	4,000	Comp.	1,000	Cross	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Karukawa, Hokkaido	.....	300	S	None	None	Op.
Nippon Oil Co., Ltd., Yuraku-Kan, Marunouchi, Tokyo	Byoritsu, Taiwan	Nobuteru Sato	200	S	None	None	Op.
Ogura Oil Co., Ltd., Kobunecho, Nihonbashi-ku, Tokyo	Tsurumi, Kanagawa	.....	7,000	S-C	1,000	Cross	Op.
Ogura Oil Co., Ltd., Kobunecho, Nihonbashi-ku, Tokyo	Tokyo, Oshima	Akira Daido	3,500	S-C	2,000	Jenkins-Cross	Op.
Total Japan			52,600		16,250		
LATVIA							
A. Oehlrich & Co., Ltd.	Muehlgraben (Riga)	.....	200	S	None	None	Op.
LIBYA							
Raffinera di Olii Minerali per L'Africa del Nord Anonima, Tripoli	.....	.....	2,000	.....	....	.....	Op.
MANCHURIA (Manchukuo)							
Manchukuo-Japan Oil Co., Hsinking	Dairen	.....	3,000	S-C	850	Dubbs	Op.
MEXICO							
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Ciudad Madero	S. Benavides	29,000	Comp.	7,600	Dubbs-Gyro	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Arbol Grande	J. Avina	10,400	S	None	None	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Bella Vista	J. A. Roque	1,000	Comp.	830	Dubbs	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Mata Redonda	R. E. de la Fuente	11,900	Comp.	6,400	Kellogg	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Poza Rica	R. Zamora	7,500	S-A	None	None	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Minatitlan	L. R. Torres	24,000	Comp.	4,000	Dubbs	Op.
Petroleos Mexicanos, Av. Juarez 92-94, Mexico, D.F.	Mexico City	F. Aznar	16,000	S	None	None	Op.
Total Mexico			99,800		18,830		
Note: C. L. Corcuera is general manager of refineries for Petroleos Mexicanos.							
NETHERLANDS							
N. V. de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan 30, The Hague	Rotterdam	.....	15,000	S-A-C	12,500	Dubbs	Op.
NETHERLANDS EAST INDIES							
Borneo							
de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan 30, The Hague	Balikpapan	.....	35,000	Comp.	7,400	Dubbs	Op.
Java							
N. V. de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan, 30, The Hague	Wonokromo	.....	2,500	S	None	None	Op.
N. V. de Bataafsche Petroleum Maatschappij (Shell), Carl van Bijlandtlaan, 30, The Hague	Tjepoe	.....	14,000	S-C	600	Dubbs	Op.
Nederlandsche Koloniale Pet. Mij. (Standard-Vacuum), Gebouw Petrolea, P. O. Box 109, The Hague	Kapoen	.....	500	S	None	None	Op.
Total Java			17,000		600		
Sumatra							
de Bataafsche Pet. Mij. (Shell), Carl van Bijlandtlaan 30, The Hague	Pangkalan Brandon	.....	18,000	S	None	None	Op.
de Bataafsche Pet. Mij. (Shell), Carl van Bijlandtlaan 30, The Hague	Pladjoe, Palembang	.....	45,000	S-C-L	2,500	Dubbs	Op.
Nederlandsche Koloniale Pet. Mij., Gebouw Petrolea, P. O. Box 109, The Hague	Palembang	H. M. Davidson	45,000	Comp.	18,000	Tube & Tank	Op.
Total Sumatra			108,000		20,500		
Total Netherlands East Indies			160,000		28,500		
NETHERLANDS WEST INDIES							
(Aruba)							
Arend Petroleum Maatschappij, Willemstad, Curacao	Bruif, Aruba	.....	20,000	S-C	2,200	Dubbs	Op.
Lago Oil & Transport Co., Ltd., Toronto, Ontario, Canada	Aruba, Curacao	L. G. Smith	285,000	S-C	240,000	Comb. visbr.	Op.
(Curacao)							
Curacaosche Petroleum Industrie Mij., Carl van Bijlandtlaan 30, The Hague	Emmastad	Dr. van N. Schonegevel	200,000	S-C	96,000	Dubbs-Cross	Op.
Total Netherland West Indies			505,000		338,200		
NORWAY							
A. S. Norsk Amerikansk Mineroloiljecompagni, Kongensgate 18, Oslo	Vallo	S. Launy	1,200	L-A	None	None	Op.
PALESTINE							
Consolidated Refineries, Ltd., Britannic House, Finsbury Circus, E.C. 2, London, England	Haifa	L. W. Chuter	40,000	S-C	20,000	Kellogg	Op.
PERU							
Establecimiento Industrial de Zorritos, Apartado 130, Calle Constitucion 25, Callao	Zorritos	.....	1,000	S	None	None	Op.
International Petroleum Co., Ltd., 56 Church St., Toronto, Sarnia, Ontario, Canada	Talara	R. H. Ebbets	20,000	S-C	6,800	Tube & Tank	Op.
Compania de Petroleo Ganso Azul, Ltda.	Aguas Calientes	.....	1,000	S	None	None	Bldg.
Total Peru			22,000		6,800		

PORTUGAL

Company and address—	Plant location	Superintendent	Crude capacity (bbl. dly.)	Type of refinery	Cracking equip. Capacity (bbl. dly.)	Cracking equip. Type	Operating status
Soc. Concessionaire pour le Refinacao de Petrole en Portugal, 57 rua do Alecrim, Lisbon	Lisbon (Cabo Ruivo)		5,000	S-C-L	1,500		Op.

POLAND

(Now Russian and German)

Galicyj-ski Towarzystwo Naftowe "Galicja," S.A., 26 Batorego, Pl. Marjacke 8, Lwow	Drohobycz	Joseph Metzis	3,000	Comp.	1,000	Cross	Op.
Galizische Karpathen Petroleum A.G., 26 Batorego, Pl. Marjacke 8, Lwow	Jedlice		1,200	S-L	None	None	Op.
Galizische Karpathen Pet. A.G., 26 Batorego, Pl. Marjacke 8, Lwow	Dziedzice		1,200	S-L	None	None	Op.
"Gazy Ziemme" Spolka Akcyjna dla Przemyslu Naftowego I Gazow Zem, Akademick 7, Lwow	Zniesienie (n. Lwow)		1,000	S-L	None	None	Op.
"Nafta" Spolka Akcyjna, 26 Batorego, Pl. Marjacke 8, Lwow	Drohobycz		1,200	S-L	None	None	Op.
Jaslo, Industrial Oil Works, Nieglowice ad Jaslo, Jaslo	Nieglowice	A. Z. Blumenthal	1,500	S-L	None	None	Op.
"Limanowa" (Towarzystwo Naftowe Spolka Z. Org. Odp., Boryslaw	Limanowa	Ludwig Muller	2,000	S-L-A	None	None	Op.
"Polmin" State Oil Works, Akademick 7, Lwow	Drohobycz	Zygmunt Bilioúchowski	3,500	S-C-L	1,000	Dubbs	Op.
"Polskie Zwiazkowe Refiner je Alejow Skanych" (Polish United Oil Refineries), 26 Batorego, Pl. Marjacke 8, Lwow	Rychcice, Drohobycz		800	S-L	None	None	Op.
"Polskie Zwiazkowe Refiner je Alejow Skanych" (Polish United Oil Refineries), 26 Batorego, Pl. Marjacke 8, Lwow	Trzebinia (Cracow)		1,500	S-L	None	None	Op.
Rafinerja Nafty "Gleboka" Spolka Z.O.O., Gleboka	Gleboka (Sambor)		100	S	None	None	Op.
Rafinerja Nafty Fabryka Olejow, Maszynowych M. H. Reich I Ska, Stryj	Stryj		250	S	None	None	Op.
Rafinerja Skawinska Zaklady Dla Przemyslu Oleju Skalnego, Griffel I Ska, Skawina	Skawina		300	S	None	None	Op.
Spolka Akcyjna Fanto, Place Maryacki 8, Lwow	Ustrzyki Dolne		1,000	S	None	None	Op.
Standard Nobel Co. in Poland, Ltd., Warsaw	Libusza		1,200	S-L	None	None	Op.
Vacuum Oil Co., S.A., Post-Dziedzice, Warsaw	Czechowice, Silesia		1,600	S-L-W	300	Cross	Op.
Rafinerja Olejow Mineralnych "Segil" Spolka, Nadworna	Nadworna		200	S	None	None	Op.
Stawiarski, R. W. & Co., Krosno	Krosno		500	S	None	None	Op.
Ten other small plants			1,000	S	None	None	Op.
Total Poland			23,050		2,300		

RUMANIA

Astra Romana S.A. (Shell), No. 32 Boulevard Regele Carol 1, Bucarest	Ploesti-Sud	E. Pfister	40,000	Comp.	13,000	Dubbs	Op.
Astra Romana-Xenia, No. 32 Boulevard Regele Carol 1, Bucarest	Ploesti-Nord	E. Pfister	6,000	S	None	None	Op.
Colombia Societie Franco-Rumanine de Petrol, 10 rue Romana, Bucarest	Ploesti-Sud	P. Bouvier	11,000	S-C	6,000	Dubbs	Op.
Concordia Societie Anonyme Rumaine pour l'Industrie due Petrole, Strada Matei Millo, No. 15, Bucarest	Ploesti-Nord	M. G. Baliff	30,000	S-S	4,200	None	Op.
Creditul Miniere S.A. Rumaine pour le Developpement, de l'Industrie Miniere, Boulevard Bratianu 16, Bucarest	Brazi-Prahova	T. Dodrescu	12,000	Comp.	3,500	Dubbs	Op.
Creditul Miniere S.A. Rumaine pour le Developpement, de l'Industrie Miniere, Boulevard Bratianu 16, Bucarest	Dolcesti		1,750	S	None	None	Op.
Dacia Romano Petroleum Synd., Ltd., 83 Cannon St., E.C. 2, London, England; Cantacuzino 33, Bucarest	Ploesti-Nord	C. M. Leitch	5,000	S	None	None	Op.
Neo Petrole (Fratia)	Ploesti-Sud		3,000	S	None	None	Op.
I. Grigorescue S.A., Str. Poetul Alexandrescu No. 30, Targoviste	Targoviste	M. Istrati	1,500	S	None	None	Op.
Noris	Ploesti-Sud		1,200	S	None	None	Op.
"Petrol Block" Societe Anonima Romana, Strada Nicolae Golescu No. 7, Bucarest	Ploesti	M. Silberstein	10,000	S-C	3,000	Dubbs	Op.
"Petrol Block" Societe Anonima Romana, Strada Nicolae Golescu No. 7, Bucarest	Bucarest	Dr. Stevermann-Dr. Lobel	2,500	S	None	None	Op.
Petrol Latina, S.A. Romana, Strada Benito Mussolini 53, Bucarest	Plopeni-Prahova		1,000	S	None	None	Op.
"Petrolmina" Societate, Romana de Mine si Petrol, Strada Gogu C. Cantacuzino 33, Bucarest	Ploesti		3,000	S	None	None	Op.
"Photogen" Rafineria de Petrol, S.A. (Socony-Vacuum), Str. Juliu Maniu 104-108, Brasov	Brasov		750	L-W-A	None	None	Op.
"Redeventza" S.A. Pentru Exploatarea si Comertul Produselor Subsolului, Rue Georges Clemenceau No. 2, Bucarest	Ploesti-Nord	M. Sain	3,500	S	None	None	Op.
Romano-Americana S.A. (Standard of New Jersey), 126 Calea Victoriei, Bucarest	Teleajen	D. I. Maxwell	20,000	Comp.	8,000	Tube & Tank	Op.
"Romano-Belgiana Depetrol" S.A., Strada Biserica Amzei No. 28, Bucarest	Ramnicul-Sarat		1,000	S	None	None	Op.
Spies Petroleum Co., Ltd., 17 Waterloo Place, S.W. 1, London, England	Ploesti		5,000	S	None	None	Op.
Steaua Romana S.A. pour l'Industriedu Petrole, Boulevard Carol No. 17, Bucarest	Campina		35,000	Comp.	8,000	Dubbs	Op.
Steaua Romana, Boulevard Carol No. 17, Bucarest	Moinesti		2,000	S	None	None	Op.
Rafinaria de Petrol Titan, S.A.R., Boulevard Carol No. 30, Bucarest	Bucarest		1,000	S	None	None	Op.
"Unirea" Societate Anonima Romanada Petrole (Phoenix Oil & Transport Co., Ltd.), Strada Gen. Berthelot No. 90, Bucarest	Ploesti (2 plants)	M. Wilson	23,000	Comp.	3,500		Op.
Miscellaneous (25 small refineries)			5,000				
Total Rumania			224,200		49,200		

SARAWAK

(British East Indies)

Sarawak Oilfields, Ltd. (Shell), Miri, Sarawak, Miri	Lutong		20,000	S-L	None	None	Op.

SPAIN

Compania Arrendataria del Monopolio de Petroles, 9 Torija, Madrid	Barcelona		1,500	S-L	None	None	Op.

SWEDEN

A. Johnson & Co., Stockholm	Nynashamn		3,500	S-C	2,700	Dubbs	Op.

TRINIDAD

Trinidad Central Oilfields, Ltd., 16 Carrnon St., E.C. 4, London, England	Claxton Bay, Tabaquite	F. Middleton	500	S	None	None	Op.
Trinidad Lake Asphalt Operating Co., Ltd. (subsidiary of General Asphalt Co.), Barber, N. J., Philadelphia, Pa.	Brighton		1,000	A	None	None	Op.
Trinidad Leaseholds, Ltd., 1 London Wall Buildings, E.C. 2, London, England	Point-a-Pierre	F. L. Melvill	35,000	Comp.	18,350	Dubbs	Op.
United British Oilfields of Trinidad, Ltd., St. Helen's Court, Great St. Helen's, E.C. 2, London, England	Point Fortin		40,000	S-C	10,000		Op.
Trinidad Oil Fields Operating Co., Ltd., Port of Spain	La Brea	R. F. Caldwell	1,300		None	None	Op.
Goldan & Co., Ltd., Mon Repos, San Fernando			500	S	None	None	S.D.
Kern Trinidad Oilfields, Ltd., 36-38 Kingsway, W.C. 2, London, England	San Fernando	A. J. Ruthven-Murray	1,000	S	None	None	Op.
Total Trinidad			79,300		28,350		

UNION OF SOUTH AFRICA

South African Torbanite Mining & Refining Co., Ltd., P. O. Box 7727, Anglovaal House, Fox Street, Johannesburg	Ermelo, Transvaal		1,000	S	None	None	Op.

UNITED KINGDOM
(GREAT BRITAIN)

England

Company and address—	Plant location	Superintendent	Crude capacity (bbl. d'ly.)	Type of refinery	Cracking equip. Capacity (bbl. d'ly.)	Cracking equip. Type	Operating status
A.G.W.I. Petroleum Corp., Ltd., Brettenham House, Lancaster Pl., London, W.C. 2	Fawley	H. D. Demoulins	12,000	S-C-A	7,000	Tube & Tank	Op.
Anglo-American Oil Co., Ltd., 36 Queen Anne's Gate, Westminster, S.W. 1, Westminster	Port Ellesmere	.....	500	.....	Specialty plant		Op.
Berry, Wiggins & Co., Ltd., Water Lane, Stratford, E.C. 2, London	Kingsnorth-on-Medwy.	W. W. Watt	2,500	S-L	None	None	Op.
Berry, Wiggins & Co., Ltd., Water Lane, Stratford, E.C. 2, London	Weaste, n. Manches'r	A. H. Hepworth	1,500	S	None	None	Op.
Cory Brothers & Co., Ltd., 57-59 St. Mary Axe, E.C. 3, London	Coryton	J. P. Johns	5,000	S-C	2,000	Cross	Op.
Herbert Green & Co., Ltd., Thames House, Millbank, S.W. 1, London	East Halton, Lincolnshire	.....	1,500	S-L	None	None	Op.
Lobitos Oilfields, Ltd., 146 Dashwood House, Old Broad St., E.C. 2, London	Ellesmere Port	J. S. Parker	4,000	S	None	None	Op.
London and Thames Haven Oil Wharves, Ltd., 3 St. Helen's Place, E.C. 2, London	Thames Haven	.....	18,000	S-L	None	None	Op.
Major & Co., Ltd., London	Hull	.....	1,250	.....	None	None	Op.
Medway Oil & Storage Co., Ltd., 76-88 Strand, W.C. 2, London	Isle of Grain, Kent	.....	3,500	S-C	2,000	Cross	Op.
Shell Refineries, Ltd., St. Helen's Court, Great St. Helen's, E.C. 3, London	Shell Haven	.....	15,000	S-L	None	None	Op.
London and Coastal Oil Wharves, Ltd., 85 Gracechurch St., E.C. 3, London	Canvey Island	.....	1,500	S	None	None	Op.
Manchester Oil Refinery, Ltd., Twining Road, Barton, Manchester	Trafford Park	A. W. Scivyer	2,000	S-L	None	None	Op.
Total England			68,250		11,000		

Scotland

Shell Refineries, Ltd., St. Helen's Court, Great St. Helen's, E.C. 3, London, England	Ardrossan, Ayrshire	.....	5,000	Comp.	1,500	.....	Op.
Scottish Oils, Ltd. (Anglo-Iranian), 53 Bothwell St., E.C. 2, Glasgow	Grangemouth	R. B. Southall	15,000	S-C-L	4,000	Cross	Op.
Scottish Oils, Ltd. (Anglo-Iranian), 53 Bothwell St., E.C. 2, Glasgow	Uphall	.....	2,500	S-C-L	500	None	Op.
William Briggs & Sons, E. Camperdown St., Dundee	Dundee	H. A. Watson	700	S	None	None	Op.
Total Scotland			23,200		6,000		

Wales

National Oil Refineries, Ltd. (Anglo-Iranian), Britannic House, Finsbury Circus, E.C. 2, London, England	Llandarcy	W. C. Mitchell	22,000	Comp.	3,500	Dubbs & Cross	Op.
Total Wales			22,000		3,500		
Total Great Britain			133,450		20,500		

UNITED STATES

Complete report published in March 28, 1940, issue of The Oil and Gas Journal. The 1941 report will be published in the March 27, 1941, issue.

URUGUAY

Administracion Nacionale de Combustibles Alcohol y Portland, 25 de Mayo 409 (P. O. Box 869), Montevideo	Montevideo	H. Fratelli	5,000	Comp.	2,000	Dubbs	Op.

U.S.S.R.

Glavneft (petroleum division), Moscow	Moscow	.....	None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Saratov	.....	None	C	35,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Odessa	.....	None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Kherson	.....	None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Nijni-Novgoroc	.....	3,500	S	None	None	Op.
Glavneft (petroleum division), Moscow	Yaroslavl	.....	3,500	S-C	2,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Orsk	.....	12,000	S-C	4,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Grozni	.....	150,000	S-C	50,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Taupse	.....	35,000	S-C	7,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Makhatch Kala	.....	2,000	S	None	None	Op.
Glavneft (petroleum division), Moscow	Krasnodar	.....	25,000	S	None	None	Op.
Glavneft (petroleum division), Moscow	Khabarovsk	.....	4,500	S-C	3,500	See footnote	Op.
Glavneft (petroleum division), Moscow	Baku-Batum	.....	375,000	S-C	50,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Ufa	.....	12,000	S-C	4,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Ishimbevo	.....	10,000	S	None	None	Op.
Glavneft (petroleum division), Moscow	Neftedag	.....	4,000	S-C	3,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Berdiansk	.....	None	C	5,000	See footnote	Op.
Glavneft (petroleum division), Moscow	Georgia	.....	500	S	None	None	Op.
Glavneft (petroleum division), Moscow	Garodki	.....	500	S	None	None	Op.
Total U.S.S.R.			637,500		178,500		

Footnote: Most cracking plants in the U.S.S.R. are of the Winkler-Koch, Gyro, and vis-breaker types modified in most cases after designs of Soviet engineers.

VENEZUELA

Caribbean Petroleum Co. (Shell), Apartado 19, Maracaibo	San Lorenzo	.....	25,000	S	None	None	Op.
Colon Development Co., Ltd. (Shell), Apartado 19, Maracaibo	Casigna	.....	950	S	None	None	Op.
Colon Development Co., Ltd. (Shell), Apartado 19, Maracaibo	La Rivera	.....	280	S	None	None	Op.
Colon Development Co., Ltd. (Shell), Apartado 19, Maracaibo	El Calvario	.....	270	S	None	None	Op.
Compania de Petroleo Lago, Apartado 849-869, Caracas	La Salina	L. R. Kirsheman	13,000	S	None	None	Op.
Standard Oil Co. of Venezuela, Apartado 889, Caracas	Caripito	D. E. Johnson	35,000	S-C	22,800	Vis-bkr.	Op.
Mene Grande Oil Co., Apartado 234, Maracaibo	Cabimas	S. H. Oter	1,500	S	None	None	Op.
Tocuyo Oilfields of Venezuela, Ltd., Caracas	El Mene de Acosta	.....	250	S	None	None	S.D.
British Controlled Oilfields, Ltd., Caracas	El Mene de Acosta	.....	75	S	None	None	Op.
Total Venezuela			76,325		22,800		

YUGOSLAVIA

Standard-Vacuum Oil Co. of Jugoslavia, Inc., Brod	Bosanski Brod	.....	2,250	L-WA	None	None	Op.
Shell Oil Co. of Jugoslavia, Ltd., Gajeva ul. 5, Zagreb	Caprag	.....	2,000	S	None	None	Op.
Ivanovic & Co., Osijek	Osijek	Ing. L. Ravici	550	S	None	None	Op.
Total Yugoslavia			4,800				

New research laboratory of the Standard Oil Co. of California. The building is on the site of the company's Richmond, Calif., refinery

Peru's Agua Caliente Field Is Developing Normally

By L. P. STOCKMAN

THE Agua Caliente field in Peru which was discovered by the Blue Goose Oil Co. in the dense Peruvian jungle east of the Andes Mountains at the headwaters of the Amazon River in February, 1939, has undergone normal development since completion of the initial well.

Plans embrace the ultimate construction of a refinery but for the present the company will proceed with development work in order to determine definitely the extent and potentiality of the structure.

The type and capacity of refinery eventually constructed depends to a large extent upon the amount of production developed and the normal market available, and consequently construction will be held in abeyance. Tentative plans call for erection of the refining unit in upper navigable water as close as practical to the field. Construction of a marine shipping terminal down the Amazon near or at Belem, Brazil, will be a later development if substantial production is developed. Location of the refining unit has been decided upon but this is subject to change as it may be another year or two before actual construction is started. Pioneer work of this nature is naturally a slow process, especially when the center of operations is so far removed from metropolitan areas. In this case the Andes Mountains west of the scene of operations rise to a height of 19,000 ft., while to the east it is over 2,500 miles to tidewater at the mouth of the Amazon.

Because it is impossible to transport heavy equipment over the Andes, access to the property of the Blue Goose Oil Co. is via the east coast of South America and up the Amazon, which is navigable to shallow-draft vessels for about 2,500 miles, and thence southwestward via the Ucayali and Pachitea rivers. These rivers at the headwaters of the Amazon appear relatively insignificant on a map but it must be remembered that the Ucayali River above Iquitos on the Amazon is more than twice as wide as the Mississippi at St. Louis. The village of Iquitos in the upper reaches of the Amazon, which at present has a native population of about 10,000, was once a thriving community and during the so-called rubber boom small ocean-going vessels picked up rubber cargo there. This indicates the importance of these rivers as Iquitos is about 2,100 miles from Belem, Brazil, on the east coast of South America. Paradoxical as it may seem, drilling equipment on this job was moved westward up the Amazon River from the Atlantic Ocean to reach a point only a few hundred miles east of the Pacific Ocean. The National Airline flies land planes over the Andes Mountains, and use amphibians east of the Andes as this permits the landing of planes on the various rivers. Iquitos and other points of habitation are on regular air routes.

Central portion of Peru, showing Agua Caliente concession and system of river transportation

Development

Four wells have been drilled on the Agua Caliente structure to date and work has started on a new program calling for three additional wells to be drilled at once. The initial well, 1 Agua Caliente, was spudded July 4, 1938. In January 1939 it had been drilled to 3,100 ft. and suspended at that depth when it failed to show commercial production. During the course of work, however, the crew noted oil and gas showings higher in the hole. After drilling was suspended at 3,100 ft., the derrick was skidded and a second hole started. The second test, designated as 1-A Agua Caliente, was completed February 26, 1939, flowing 750 bbl. of clean 45° oil from 1,175 ft. and was shut in March 12, 1939. A 7-in. water string was landed at 1,025 ft. The well flowed for 6 days at the rate of 750 bbl. daily through a ⅝-in. bean and when the bean was opened an additional ⅛ in. the flow increased to 1,000 bbl. per day. The first hole cored a more promising oil sand than the one tested at 1,175 ft. and thus additional drilling may indicate a second productive horizon with greater producing possibilities around 1,800 ft. For the present, however, the company is concentrating drilling operations on shallow sand.

Comparatively little gas is produced with the oil but the natural flow, indecisive as brief tests to date may be, possibly reflects favorable hydrostatic pressure. The third well drilled, 2 Agua Caliente, was located downstructure and failed to produce at 3,000 ft. and was suspended without a test late in 1939. The fourth well drilled, 3 Agua Caliente, was finished earlier this year producing 200 bbl. per day from 1,180 ft. The two wells completed to date are capable of producing a little more than 1,000 bbl. of high-gravity crude oil daily.

With the experience gained from the drilling of four wells, engineers are now fortified with more subsurface data and therefore the locations recently selected are based on accumulated information.

All drilling undertaken in the Agua Caliente area

by Blue Goose Oil Co. has been done by Drilling & Exploration Co. which was recently awarded the contract to drill the three additional wells. The corporate name of the Blue Goose Oil Co. is Ganzo Azul Compania de Petroleo.

Wood, of which there is an unlimited supply available, was used as fuel under the boilers during the early stages of development and the presence of a natural spring on the property afforded an ample supply of water. Upon completion of 1-A Agua Caliente, the discovery well, Ralph Marshall, of Drilling & Exploration Co., improvised a tea-kettle distillation unit from material on location and thus the boilers of all subsequent Agua Caliente wells have been fired with fuel obtained from the distillation unit. This distillation unit was fabricated from three joints of 12-in. casing and the coil was made of 2-in. pipe. The fire box is of brick and the condensing equipment consists of running spring water over a coil. The unit has a capacity of 5 bbl. per day and produces a gasoline and diesel cut in addition to the fuel oil necessary for boiler purposes. The gasoline and diesel fuel is used in the tractors and other automotive equipment. No distribution range is available for the gasoline and diesel.

H. B. Syndicate

View of International Petroleum Co., Inc., refinery at Talara, principal oil town of Peru

Structural Conditions

The Agua Caliente field is part of a 90,000-acre concession granted by the Government of Peru several years ago and geological reconnaissance indicates that about 40,000 acres are on structure and should prove productive in whole or in part. The concession is about 61 miles from the banks of the Pachitea River, a tributary of the Ucayali which in turn is a tributary of the Amazon, and is approximately 600 miles northeast of Callao, a seaport on the west coast of Peru. The structure, which has a closure of 3,600 ft., is featured by a very pronounced sandstone scarp which encloses the entire structure. Inside this encompassing scarp is a pronounced turtle back. The outer sandstone scarp that surrounds the lower level of the structure is about 500 ft. above sea level and the turtle back which forms the top of the structure rises about 800 ft. above the scarp. Topography is very rugged, the canyons having walls so precipitous that it is almost impossible to climb many of them. Production comes from an oil sand above 115 ft. of shale in a limestone formation of Cretaceous age. The Cretaceous in this area is probably quite similar to the Cretaceous in the Rocky Mountain region. The Agua Caliente structure is definitely of the Rocky Mountain type and forms a pronounced anticlinal ridge quite similar to Kettleman Hills in California although much larger in extent. The Agua Caliente field is on an extensive plateau extending eastward from the rugged Andes. A second structure lies southeast of the Agua Caliente anticline now undergoing development and its proximity and trend of the axis indicate that the two structures have a common origin. No seepages were found on either the north or south anticlinal structures in the Agua Caliente area but extensive seepages of oil and gas were found about 20 miles southwest of the new field, thus indicating that under proper structural conditions oil and gas might be expected to accumulate.

Agua Caliente is the first productive oil field found in Peru east of the Andes as previous production of crude oil has been restricted to a narrow coastal belt about 5° south of the Equator and located in close proximity to tidewater. Coastal production is from Tertiary rocks mostly of Eocene age in contrast with conditions at Agua Caliente where production is from Cretaceous age rocks.

Crude oil produced from the Agua Caliente anticline has a paraffin base, is dark in color and is free of sulfur. The crude has high gasoline content and the motor fuel derived therefrom is doctor sweet without treatment. It yields approximately 69 per cent gasoline and 15 per cent kerosene or light distillates. The oil member in the Agua Caliente structure is not a solid sand body but the pay is sufficiently saturated to result in a natural flow. The pay has a porosity of from 25 to 29 per cent and a permeability of from 225 to 540 millidarcys.

Pioneer Work

A total of 150 men, including native Peruvians, was used at various times on the project and, for the most part, three tours were run daily while drilling. The difficulties encountered in pioneering this area appeared almost insurmountable several times but persistent efforts finally won out. Because of the rough terrain, inundated areas and dense jungle conditions with profuse vegetation, an engineering party spent almost 2 years in the country preparing to receive drilling equipment and making other necessary arrangements prior to the starting of work. A meteorological station was established at the Agua Caliente camp before actual drilling was started and a short-wave radio broadcasting and receiving set was installed. Weather reports, prepared at Agua Caliente, are complete to the smallest degree. It has been found the maximum temperature is 100° F. and the minimum temperature is 58° F. The average rainfall in the Agua Caliente area is 62.76 in. annually. The heaviest rainfall recorded was 3.7 in. in 24 hours. The humidity, which is very high, averages about 60 in the afternoon and about 90 in the morning. The Agua Caliente meteorological station, in addition to other standard equipment, also has a sun ball for recording the actual hours of sunshine.

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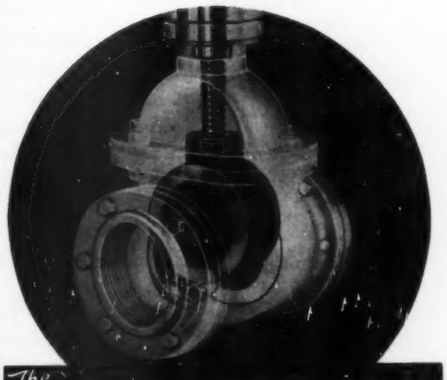

The LUDLOW VALVE MFG·CO·INC· SINCE 1866 TROY·N·Y·

The sun ball consists of a sphere, magnifying glass, clock arrangement and mounting. The magnifying glass focuses the rays of the sun on a calibrated chart on the spherical member and thus records the actual amount of sunlight each day. Because of the proximity of the Agua Caliente region to the Equator, the seasons do not show as much variation as other areas further removed.

A total of 11 bridges and 35 culverts was constructed out of native material to reach the Agua Caliente drill site. Long stretches of corduroy road were necessary in order to cross low inundated marshy areas. Drilling equipment and other material was shipped from New York and discharged at Belem, Brazil, from which point it was loaded into barges for transshipment up the Amazon to Iquitos. About 1,000 miles up the Amazon, near Manaos, Brazil, the tug which was towing three barges laden with 400 tons of equipment hit a submerged tree and went to the bottom. About 150 tons were recovered but high water prevented further salvage and necessitated reordering some of the equipment. This resulted in a delay of 5 months in addition to another delay of 7 months due to unexpected difficulties concerning the concession. When the new material arrived it was loaded into barges and towed to Iquitos with a 600-ton tug and from this point up the Ucayali and Pachitea rivers with a 300-ton tug. The final 400-mile haul was made by truck and tractor. It is interesting to note that the original drilling equipment, once in place at Agua Caliente, has given complete satisfaction and is still in use. No mechanical trouble has been experienced with the surface equipment and this same rotary drilling equipment will be used on the next three wells. Since drilling the discovery well, dock facilities have been constructed on the Pachitea, 7 miles from the scene of operations, where equipment is now docked.

Development of production on the Agua Caliente anticline successfully climaxes efforts extending over a period of almost 10 years.

Robert B. Moran, an independent consulting geologist and engineer of Los Angeles and now president of the Blue Goose Oil Co., succeeding William C. McDuffie, was instrumental in completing the reconnaissance work and preparing the geological and structural maps. About 10 years ago Mr. Moran traveled by National Airline from San Ramon to Iquitos at the headwaters of the Amazon on a business mission. The route by plane was over dense jungles almost all the way and among these heavily wooded jungles he was impressed by a topographic feature. Thick underbrush and heavily wooded condition of the terrain prevented determination from the air whether the dome was a structural high or an erosional feature. The impressive appearance warranted further investigation. Mr. Moran later led a geological party into the interior from Lima, Peru, and found it to be a large structural feature with interesting possibilities. This reconnaissance trip was successful although it took the party 11 days to go about 500 miles. The party had to travel 1,100 miles to penetrate 500 miles inland from the seacoast and in doing so was obliged to cross the Andes where they rose to a height of 16,000 ft. In 1933, Bart Gillespie and Douglas Fyfe led a party to the site to make additional observations, stake location for the first test and make preparations for the reception of drilling equipment and personnel.

•

Japan Seeks N. E. I. Oil for "Co-Prosperity Sphere"

(Continued from Page 83)

planned to produce 80,000 koku of "etherized" alcohol which is said to eliminate the bad starting characteristics from alcohol-gasoline blends.

In the Diet session of February 12 the finance minister revealed in reply to an interpellation that alcohol production within 2 or 3 years will be 800,000 koku. In 1939, government plants produced 130,000 koku, private distillers 240,000 koku, making a total of 370,000 koku or approximately 17,500,000 gal. The minister admitted that, to sell a gallon of blended gasoline at the official price, the government must meet a loss.

Ordinary wood charcoal was by far the most popular "ersatz" fuel, and a majority of the buses, many trucks, and even a few passenger cars are now equipped with carbon monoxide generating devices. To handle the increasingly complex distribution of charcoal, a semiofficial agency was established with a capital fund of 5,000,000 yen.

Industrial Consumption Figures Published

Since the outbreak of the European war it has become a favorite pastime among economic writers to speculate on the petroleum requirements of the belligerents. It is perhaps not without interest to quote some Japanese figures on wartime consumption, even though they are not indiscriminately applicable to European conditions. They are, however, illuminating in that they shatter the widely held belief that industrial fuel consumption must perforce multiply as industry is geared to wartime requirements. According to the Department of Commerce and Industry's "Factory Statistics" for 1938 (the second year of the China hostilities), Japanese industries consumed 7,198,000 hl. of mineral oil in 1936 (the last pre-"incident" year), which dropped to 6,873,000 hl. in 1937. In 1938, consumption did pick up slightly, to 7,370,000 hl. This was distributed over individual industries as follows (in thousands of hectoliters):

Textiles, 158; iron, steel and other metals, 3,578; machinery and tools, 1,411; ceramic industry, 412; chemical industry, 1,562; woodworking, 19;

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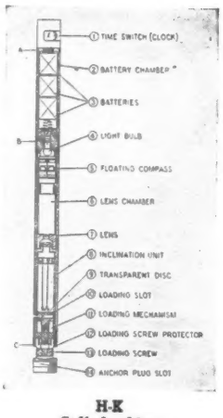

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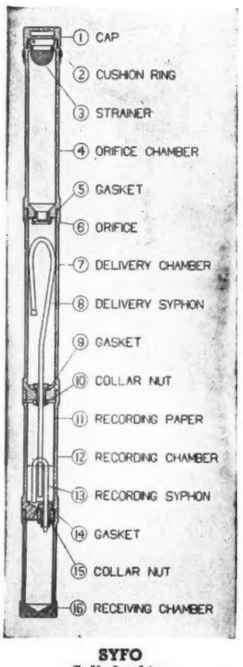

SYFO
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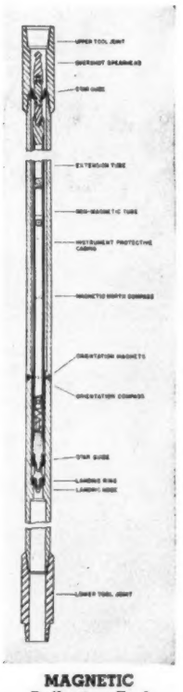

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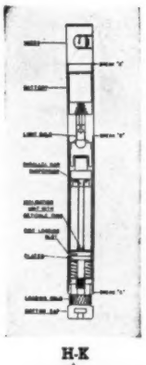

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printing and bookbinding, 24; foodstuffs, 142; gas and electric industries, 36; others, 28.

On the other hand, consumption of coal increased from 17,510,000 tons in 1936 to 24,461,000 tons in 1938; of coke, from 1,110,000 tons to 3,384,000 tons; of electric energy, from 13,594,000,000 kw.-hr. to 18,587,000,000 kw.-hr.

These figures show that alternative energy sources, combined with economy in nonessential oil consumption, are capable of keeping wartime oil consumption in industry close to peacetime levels.

These statistics do not cover direct oil consumption by the military forces, for which no figures whatsoever are available. However, overall estimates of apparent Japanese oil consumption, which do not take storage into account, do not seem to substantiate the theory that military consumption in wartime is necessarily many times higher than in peacetime. There can be little doubt that a "blitzkrieg" operation such as the German thrust through the Lowlands and France last spring calls for enormous amounts of motor fuel, but as the European war now stands, it has many features in common with Japan's 3½-year-old "incident"—a stabilized front line extending over several thousand miles far from home bases, daily aerial forays into enemy territory, and a considerable increase in fuel-consuming floating tonnage.

U. S. Share Increasing

Neglecting Japan's own small fuel production and supposing that storage is kept intact, imports provide a fairly reliable clue to consumption. Japan has not published quantitative import statistics since July, 1937, but the expenditure on imports is known to have increased from 184,000,000 yen in 1936 to 280,000,000 in 1937, and to 320,000,000, in 1938. However, in 1939 imports dropped to 255,000,000 yen. Statistics for the first 7 months of 1940 indicate that recent imports have remained at this level.

The development is traced in detail in the following table, wherein the Japanese monetary unit is converted into United States dollars at the rate of exchange indicated:

JAPANESE IMPORTS OF MINERAL-OIL PRODUCTS

	Million yen	Conversion	Million dollars
1936	184	28.96	53
1937	280	28.72	78
1938	320	28.44	91
1939	255	25.98	66
October, 1939	19.3	23.44	4.5
November	12.0	23.44	2.8
December	12.0	23.44	2.8
December	33.4	23.44	7.8
January, 1940	28.1	23.44	6.6
February	29.8	23.44	7.0
March	35.1	23.44	8.2
April	21.8	23.44	5.1
May	21.9	23.44	5.1
June	19.8	23.44	4.6
July	22.0	23.44	5.1

The year under review witnessed a definite turn for the worse in American-Japanese relations, a circumstance which did not remain without effect on Japan's oil policy, while this policy, as pursued by the Japanese, has contributed in turn to a further aggravation in the two nations' relations.

The American-Japanese Treaty of Commerce and Navigation expired January 26, after a statutory notice period of 6 months; embargoes followed, first on shipments of gasoline-refining equipment and blueprints therefor, later also on high-test airplane fuel and aviation lubricants, and the last few months of the year saw both nations rapidly preparing for the final showdown which, when it comes, will either be preceded or followed by a total embargo on American shipments of mineral-oil products and all other war materials to the Japanese Empire.

The United States' share in Japanese imports of mineral-oil products has advanced steadily during the past few years, notwithstanding Japanese efforts to spread embargo and other strategic risks over a large number of supply sources.

Japan Interested in Rumanian Oil

A trade agreement was concluded with Rumania last March, under which Japan undertook to supply cotton goods in return for Rumanian gasoline. This agreement became inoperative upon Italy's entry into the war.

On April 23, the parliamentary undersecretary for mines, Geoffrey Lloyd, informed the House of Commons in London that the Anglo-Iranian Oil Co., in which the British Government is the largest shareholder, was supplying oil to Japan on a "purely commercial basis." He refused to divulge how much oil Japan was getting, but the amounts involved cannot have been large since total Japanese merchandise imports from Iran during the first 3 months of 1940 were returned at less than $140,000. However, during the corresponding period of 1939 Japanese imports from Iran had totaled but $4,400. No information is available as to whether this trade still continues.

Trade negotiations between Japanese and Soviet representatives went under way in Moscow early this year, and it is likely that oil has figured large in these talks. Prior to the total breakdown of trade relations in 1937, the Japanese bought considerable amounts of Soviet oil, but for the most part from Black Sea pipe-line terminals, which are not now accessible to Japanese tankers. At any rate, the negotiations have, at this writing, not come to a successful conclusion.

Mexico, again, was in the news as allegedly desirous of selling her surplus oil production to

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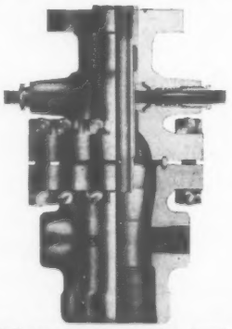

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Japan. In March it was reported that the Osaka Shosen Kaisha, the Japanese shipping concern, had been approached by the Mexican Government with a proposal to extend its South America service to the port of Alcopulce, on the Pacific Coast; and plans were announced for the construction of a 12-in., 187-mile pipe line, from Puerto Mexico, to Salina Cruz. The project was to obviate the necessity for the Japanese to haul the Mexican oil through the Panama Canal. It is, however, obvious by now that the Mexican Government has no desire to obstruct the American embargo policy. Mexico has, in fact, held up several shipments of crude oil for Japan recently, a measure which gave rise in Tokyo to fears that an undeclared embargo is already in operation.

Japan Wants East Indies' Oil

All these distant sources of crude oil would be of small help to Japan in case of an involvement with the United States and Great Britain, since the United States would be in a position to blockade the entire Western Hemisphere to Japanese tankers, while Great Britain holds the gateway to all of continental Asia from Singapore due west.

Even without these strategical contingencies in mind, Japanese efforts towards a geographical diversification of supplies are hampered by a chronic shortage of tankers. The subject of tanker construction was discussed in the last Diet session, and it was agreed that a fleet of "supertankers" was an absolute prerequisite to the execution of Japan's oil policy. It is not known how many "supertankers" have been built since, but several Norwegian and Dutch tankers formerly chartered to Japanese oil companies were transferred to British registry.

The invasion of the Netherlands in May marked a definite turn in Japan's import policy. Japanese leaders at once expressed grave concern over the preservation of the "status quo" in Netherlands East Indies, the orphaned Dutch colony in the Far East. Within a few weeks it developed that Japan claimed special rights to the mineral resources of the island empire, and a new slogan was coined in Tokyo to suit the situation: "Greater Asia Co-Prosperity Sphere," of which Dutch East India was to become the tropical southern fringe. Japan's ambitions were bluntly expressed in a Foreign Office statement June 28, which said in part:

"The Japanese Government, however, are desirous that the governments of the Netherlands and the Netherlands East Indies actively take appropriate measures in order to definitely assure the exports of the desired quantities of the required goods of the Netherlands East Indies, and also dispose promptly the question regarding the Japanese enterprises and entry of Japanese."

This meant, as applied to oil, that Japan was no longer satisfied with Dutch assurances that shipments of oil products to Japan would be continued, but that the Japanese demanded the "desired quantities" apparently without regard to the colony's obligations as a belligerent and ally of Great Britain, and moreover desired a share in the development of N.E.I. oil resources by Japanese enterprise.

Mission Is Sent to Batavia

That the crude-oil resources and some of the refining plants of the colony are occupying Japanese interest more than any other N.E.I. mineral product became plain 3 months later, when a Japanese mission headed by the minister of commerce and industry, Ichizo Kobayashi, arrived in Batavia to attempt final agreement.

Although ostensibly concerned with questions of general trade adjustment, it soon became clear that the Japanese were after the colony's oil.

Full details of the agenda are not known, but one of the issues, which led to the temporary breakdown of the negotiations on October 21, and the departure of the Japanese chief delegate, was the Japanese claim to the output of the colony's high-test aviation fuel, a claim which conflicted with prior sales commitments in England and, since the facilities are partly controlled by Americans, with the American embargo policy.

The Japanese also attempted to break down the Dutch policy of restricting exports of crude oil in favor of finished products, a policy which is largely responsible for the decline in Japanese imports from the colony. In the course of the past few years the Japanese have built up a refining industry of considerable capacity, and interest in finished products has diminished proportionately. The Dutch counterargument is that oil refining is an important industry and revenue source in the Netherlands East Indies, and that substantial native and foreign investments are at stake.

The actual extent of Japanese oil imports from Dutch East India in recent years was as follows: 65,300,000 yen in 1937, 44,400,000 in 1938, and 29,800,000 in 1939, corresponding respectively to 23.0, 13.7 and 11.6 per cent of Japan's total imports. This year's imports are believed to have been somewhat larger.

Japanese Company Strikes Oil in Borneo

It is not known how far the Japanese pushed their demands for a share in the exploitation of N.E.I. oil resources, but Dutch policy on this point is no secret. While British and American capital was openly invited to assist in the development of the colony's oil resources, Japanese overtures have been consistently declined.

There was one exception in 1929, when the Borneo Petroleum Co., a Dutch-Japanese enterprise with majority control invested in the Mitsui Bussan Kaisha and the Japan Petroleum Co. ob-

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tained a charter to engage in prospecting in Dutch Borneo. The Netherlands East Indies Government general retained the right, however, to expropriate the firm's wells and equipment against compensation.

Coming as an anticlimax to Japan's pressure diplomacy, the company struck oil for the first time on August 15, 1940, after 10 years' effort.

Japanese exports of mineral-oil products have apparently not duplicated the amazing record of 1939. Business continues to be confined to the "yen bloc" area, i.e., Kwantung, Manchukuo, and the Japanese-occupied parts of China. Publication of statistics was suspended after March, 1940.

Details for the past few years are shown in the table at upper right.

JAPANESE EXPORTS OF MINERAL-OIL PRODUCTS

(In kiloliters)

	Crude and heavy oil	Gasoline	Kerosene	Light oil	Machine oil	Mineral grease (100 kg.)
1936	.....	532	63,838	.....	41,176	.....
1937	408	302	16,969	992	19,975	13,252
1938	1,137	17,960	20,195	2,422	30,433	20,914
1939	98,797	1,111,961	1,136,410	29,827	1,823,946	281,448
1940, Jan.-Mar.	4,007	10,622	13,808	745	8,359	10,695

Japanese Corner Central China Market

Friction between foreign oil interests in Central China and the Japanese military authorities has become more intense in 1940. Although the Japanese account for but a fraction of the total imports (see table), there is a tendency to make the oil business a Japanese monopoly by barring foreign establishments from the use of transportation facilities to the hinterland.

SHANGHAI MINERAL-OIL IMPORTS

(In kiloliters)

1939—	From Japan and Kwantung	From N.E.I.	From U.S.A.	Total
Gasoline	119	52,267	12,433	64,816
Kerosene	5,277	77,640	12,754	95,878
Lubricants	2,480	.....	16,067	19,721
1940, Jan. Sept.—				
Gasoline	2,141	49,037	8,759	60,641
Kerosene	9,382	77,562	25,519	112,592
Lubricants	1,685	.....	13,099	15,473

The Japanese argument is that the foreign firms, if allowed to trade freely in Central China, cannot be prevented from dealing with Chinese guerilla forces, and an order was given early in July that shipments and sales must be handled by authorized Japanese dealers.

The foreign firms—Asiatic Petroleum Co. (Shell), Standard-Vacuum, and Texaco—have therefore been confronted with the option of either discontinuing oil imports altogether or of turning over their products to the Japanese for handling, sacrificing in either case the costly storage installations which have been built up throughout China.

While the Japanese argument is not without point and would have been accepted as inevitable corollary of the state of war now existing, the foreign oil firms suspect that other than military considerations are back of the Japanese move. In Manchuria, Korea, North China and Japan the foreign companies have been rapidly and summarily eliminated from the profitable distribution phase of the business, and in the light of these bitter experiences the new restrictions are not being viewed with optimism.

It was obviously in protest against these restrictions that the foreign firms, in October, decided to transfer part of their Shanghai storage to Singapore and Hongkong.

Japanese Oil Profits Increasing

Several Japanese oil companies undertook capitalization increases in 1940 or obtained official authorization to do so:

Japan Petroleum Co. from 80,000,000 yen to 120,000,000 yen; Kokura Petroleum Co. from 20,000,000 to 27,500,000; Maruzen Petroleum Co. from 15,000,000 to 25,000,000, and Imperial Petroleum Resources Development Co. was organized with a capital fund of 10,000,000 yen.

Business was favorably affected by the depreciation of the Japanese currency in September 1939, and the subsequent upward revision of sales prices, enabling firms handling locally produced crude or selling from old imported stocks to reap substantial profits.

BUSINESS RESULTS OF JAPANESE OIL COMPANIES

Firm—	Capitalization 1,000 yen	Profit rate in per cent 1940	Profit rate in per cent 1939	Dividends rate in per cent 1940	Dividends rate in per cent 1939
Japan Pet.	80,000	32.6	31.8	8	8
Maruzen Pet.	15,000	25.1	28.9	9	9
Chosen Pet.	20,000	39.8	27.0	9	8

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Vigorous Search for Reserves Successful in U.S.S.R.

By MICHAEL JOEL

Years of service in the petroleum division of Amtorg Trading Corp. have qualified the author for this discussion of U.S.S.R. developments. Recently Mr. Joel resigned to engage in consulting work specializing in Russian oil operations. The accompanying article is based on authoritative reports and personal contacts.

THE Oil Industry Commissariat of the U.S.S.R. organized more than 490 geological, geophysical and test-drilling parties this year in all parts of the country, including the Far East, Siberia, the Ukraine, Middle Asia, the Ural-Volga regions, and the Leningrad and Moscow areas, resulting in important discoveries and additions to industrial reserves of oil and gas. The 1940 volume of exploratory and predevelopment work was about double the 1939 total. Primary exploration was completed in 20 new areas which are ready now for development, the preparation for test drilling in 46 other previously explored districts, core drilling in numerous known structures, and the discovery, with the aid of geosurveys and geophysics, of several new structures. Independent work of the regional oil organizations also resulted in new discoveries. The most important new developments will be described in this article by regions.

Additions to oil and gas reserves in the Soviet Union result from the exploratory work of both the Oil Industry Commissariat (a cabinet department of the government) and the regional oil organizations. While there is some overlapping, it may be said, broadly speaking, that the activity of the geological and prospecting departments of the Oil Industry Commissariat is confined to unproved areas outside the settled oil regions and the creation of new centers of oil and gas production, while the work of the regional combines consists in the search for new horizons, extensions, and structures in their own bailiwicks, in addition to the routine compilation and revision of operating data for their own producing subsidiaries.

Exploration

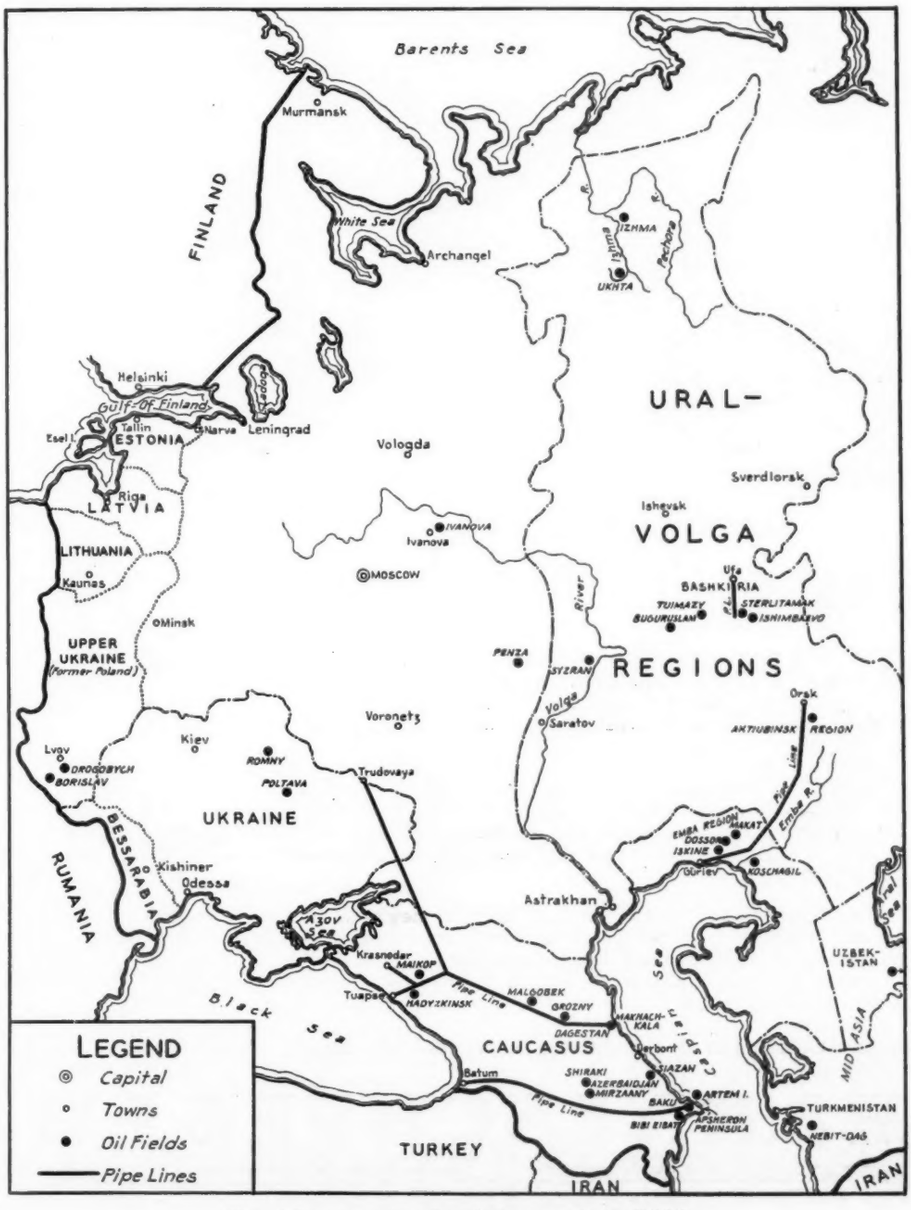
The Russians took to geophysical methods with enthusiasm. The use of geophysics is now routine in all areas. All branches of this science receive wide play and intensive study. The role of "pure" physics is also growing and some interesting work has been done in this field at Baku, resulting this year in new inventions which are already in an industrial stage. In the domain of geochemistry, new developments this year arose out of the work of the radium expedition dispatched to Ukhta, in the northern parts of the Ural-Volga regions. Having in mind the accidental discovery, in 1926, of radioactive substances in the oil-well brines of many Soviet oil fields, the expedition successfully combined its search for such materials with the oil prospecting now going on in the Ukhta region. While not claiming that all these substances are genetically connected, Professor Fersman, the leader of the expedition, is convinced that they are associated by commonness of process, which suggests a number of important principles for prospecting work in oil, gas and radium.

The changes that are taking place in the geographical distribution of crude-oil production in the Soviet Union are indicated by the following figures, which are taken from Soviet sources:

PRODUCTION OF CRUDE OIL IN THE U.S.S.R.

	1913	1932	1935	1938	1939
Production, metric tons	9,193,000	21,413,000	25,136,000	30,200,000	31,000,000*
	Per cent of total				
Azerbaidjan	83.0	57.0	77.0	73.4	74.5
Grozny	13.1	36.0	12.5	(1)	(1)
Maikop	0.9	4.3	4.8	(1)	7.0
Mid. Asia	1.7	0.4	2.0	(1)	(1)
Emba	1.3	1.2	1.1	(1)	(1)
Sakhalin	...	0.8	1.0	(1)	(1)
Ural-Volga	...	0.3	1.6	4.3	6.4

*Estimated. (1) Not available.



Map of the most active oil-producing areas in the U.S.S.R.

The changes that are taking place in the geographical distribution of crude-oil production in the Soviet Union are indicated by the following figures, which are taken from Soviet sources:

The growing importance of the new Ural-Volga regions (the "second Baku") is apparent, as well as the decline of Grozny from its 1932 peak. While full details for 1939 are not available, Soviet reports indicate that Grozny's share, by the end of that year, had fallen to about 10-11 per cent. New developments this year are probably changing the Grozny picture for the better, as will be shown below. Azerbaidjan, meanwhile, retains its dominating position, but a shift in importance is indicated for the near future by the following changes in the reserve situation:

	1932	1939
Azerbaidjan (share of total U.S.S.R. crude oil reserves)	80.8%	29%
All others	19.2%	71%

New Production

AZERBAIDJAN.—The principal source of new production in the older oil fields is found in following up the socalled "PK" (Podkirmakinskaia svita, i.e. the sub-Kirmak series) on the Apsheron Peninsula. The 1938 discovery in this structure on the Patamdarsky Plateau is now an important producing field about 375 acres in area, and at Artem Island, where the PK was discovered in 1936, this structure is now the principal object of development, the best pay being offshore. A more recent development in this structure is the eastern part of Ilyich Bay (near Bibi-Eibat). A deep test here struck oil in July of this year at 2,240 m., flowing 200 tons daily and proving a new section extending far out under the Caspian Sea. By September derricks were scattered all over this wing of the bay and shore operations were in full blast. Barges move equipment to the drilling "islands", some of which are 1,100 to 2,000 m. from the shore. Pipe lines were being laid to carry the drilling mud to the rotaries and to serve as oil lines after completion of the wells.

Sovfoto

View of the Baku oil fields in the Caucasus, one of the world's richest fields

The sub-Kirmak series was the deepest pay formation known on the Apsheron Peninsula until this year, but in September a deeper productive horizon was discovered at Kala when 1058 Azizbekoneft came in with 200 tons of daily production. The new stratum has been named the Kalinsky layer. Intensive drilling is now under way to the new sands in the Kala field. A new field has been opened this year at North Surakhany and adjacent area, yielding new production of the famed Surakhany "white" crude.

An entirely new oil region in Azerbaidjan went into production this year at Siazan (northeast Azerbaidjan on the Caspian Sea). The field is evidently large because an independent producing trust has been organized for its exploitation, making the newest member of the Azerbaidjan Oil Combine. Siazan was prospected in 1928 and 1931. Core drilling in 1933 disclosed the existence of high-gasoline crude in several places, but activity was interrupted for a number of years. Drilling by the new trust is now proving and extending the productive area, and although production was shut in at the beginning of the year due to lack of facilities for handling the crude, conditions are favorable for quick development. The light crude is found at shallow depths, permitting rapid completions. A railroad and the Baku highway pass through the region. The Caspian is available for water transport of equipment and supplies, and the aqueduct to Baku also passes nearby. Consequently the complex technical conditioning of the new field for the handling and transportation of crude oil is being pushed. The Siazan structure is an anticlinal fold complicated by an overthrust, and the pay sands are analogous to or connected with the Maikop series.

GROZNY.—The principal cause of Grozny's decline in the past few years, according to official reports, is the fact that the local combine operated on the theory that the immediate Grozny regions were depleted. Prospecting and wildcatting were transferred to inaccessible mountainous areas on

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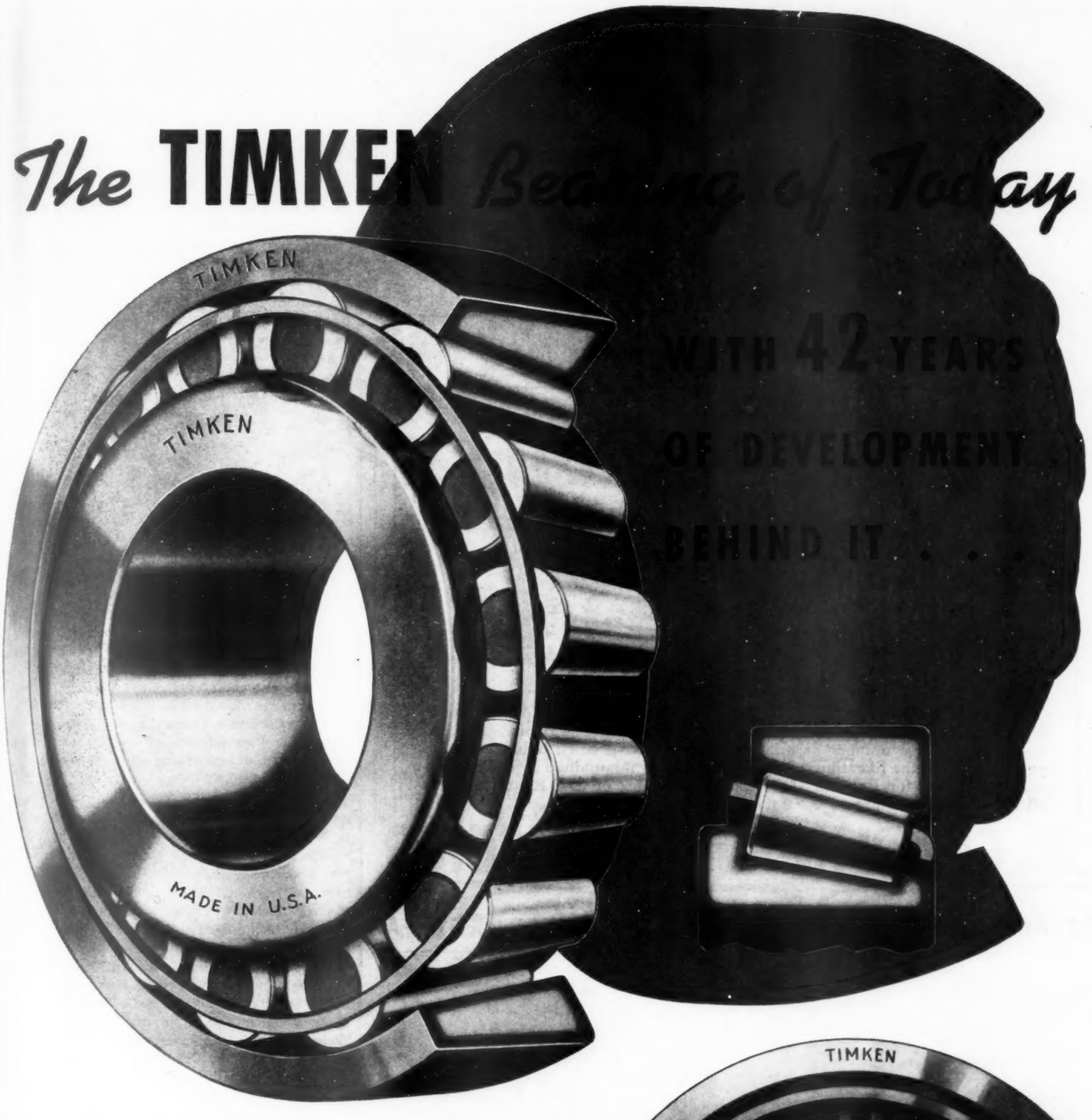

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the far side of the Yaman-Su River which had to be crossed several times in transporting barite, cement, and drilling equipment, so that the whole venture was attended by difficulties and expense. The results were negligible; but since this practice had the authority of an official "theory" behind it, the attempt continued through 1939. The whole situation at Grozny was subjected to a critical analysis early this year in the Oil Industry Commissariat; it was then recognized that the entire prospecting theory at Grozny was erroneous, and a program of intensive testing and exploitation drilling was laid out for the immediate Grozny territory.

The first problem to be attacked was the highly petroliferous "podnadvig" (under-overthrust) formation, discovered at Starogrozny (Old Grozny) in 1932, but neglected since then because of the difficult directional drilling necessary to get the oil. The Grozny podnadvig, according to Soviet geologists, is unique. The productive sands, at about 2,000 m., are deposited perpendicularly to the earth's surface. In the first flush of activity, following the reformation of Grozny's exploration program, drilling to the podnadvig at Starogrozny proceeded too rapidly and apparently with inadequate technical preparation, considering the peculiarities of the structure, because many breakdowns are reported. However, the high productivity of the XVI stratum was fully proved in July when a pay at about 1,800 m. yielded 200 tons daily. In the meantime, a new method of angle drilling has become available to Soviet drillers which is reported to be greatly superior to the whipstock method and may solve the problem of the Grozny podnadvig.

But what is characterized, in Soviet reports, as finally exploding all theories of the drying up of Grozny, is the Oisungur strike. Oisungur is a new pool, 60 km. east of Grozny. The discovery well, No. 3, in November 1939, gave inconclusive results, but No. 5, when tested at 1,460 m. at the end of July 1940, showed flush production of light crude, with a shut-in pressure of 30 atm. Tested again on August 8 and 9, the well yielded 250-300 tons daily of very light, clean oil. Several other tests were going down at the time, and subsequent reports in the Soviet press speak of this field as a sensational find. Tank storage is being provided and a pipe line is under way to connect with the nearby Makhach Kala-Grozny trunk line. Another new field mentioned in this vicinity is Bori-Su, but no details are available.

URAL-VOLGA.—This area includes the "second Baku" development and is sometimes referred to as the oil regions of the east since it follows roughly the eastern boundary of European U.S.S.R. The Ishimbaevo-Sterlitamak fields are in the center of this region, and many other oil fields, recently developed, are scattered up and down this "Mid-Continent" of the Soviet Union.

Among the new big fields is Syzran, on the Volga River, now an important producing center, with a large refining development under way.

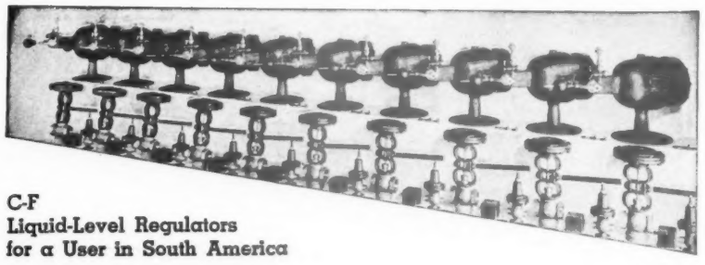
It will be noted that Syzran is on the western bank of the Volga. The extension of oil-and-gas prospecting westward from the Ural-Volga regions, based on the discovery of the Syzran and analogous structures across the river, has resulted in further discoveries this year in the Penza district at Bulychevo and (still further west) in the Ivanovo district, in the largest consuming center of the Soviet Union.

The big development of the year in the Ural-Volga area is Buguruslan (between Syzran and Sterlitamak), which has assumed major importance as a result of this summer's prospecting work. About 1,250 acres of new flush production have been proved, with the pay sands only 250-300 m. deep. Production has been climbing steeply in this field and well completions by 1941 are expected to bring the output next year to a rate 20 times higher than that of 1940.

At Tuimazy in Bashkiria, about 150 km. northwest of Sterlitamak, successful wildcatting this summer has considerably enlarged a 1937 discovery both in depth and in area. Every test this summer was a producer, although as the drillers worked back and forth across the region various horizons yielded oil. In this connection, a special test was arranged north of the field which was carried through all the sedimentary formations until the drill entered crystalline rock at 1,738 m. Several saturated limestone beds of the Devonian age were found, and the test is supposed to have cleared up the question as to the oil productivity of the more-ancient strata in the western slopes of the Urals. Current tests of the Devonian formations are expected to change the reserve picture of the Ural regions.

THE UKRAINE.—The 1939 discoveries at Romny (about 180 km. northwest of Kiev) were followed up this year by extensive testing in the whole area. No. 29 on the Romny salt dome came in unexpectedly in September of this year at 2,100 m. (the hole was scheduled to go to 2,800 m.). Four or five other producers are mentioned in this vicinity, as well as discoveries at Dmitrovka, about 90 km. away. An oil area about 150 km. long and 50 km. wide has been outlined by these discoveries. An oil strike is also reported at Lubna in the Poltava district. The crude rises to the surface but pumping is necessary for continuous production, as is true also at Romny.

As to the condition of the oil industry in western Ukraine (former Poland), reports indicate that producing and refining units are in full operation this year, new equipment and advanced methods are being introduced, and new production diligently sought. In Borislav alone, by August 1940, 790 shutdown wells had been restarted, 30 abandoned wells revived, 9 new wells completed, and 15



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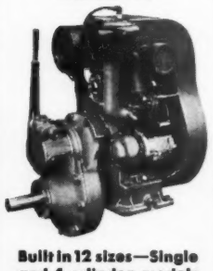

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drilling. Ozokerite mines are in operation on a full-production basis. The Ukrainian Oil Combine is making thorough geological surveys of the acquired territory, as well as in Bukovina, where good oil prospects have been found near the Putilla and Sergie rivers.

Other regions where sufficiently favorable indications have been found with the aid of geology and geophysics this year to justify full-scale test drilling in 1941 are Tavdinsk in western Siberia, Tolbinsk in Yakutia, the Ayano-Maisky district near the Sea of Okhotsk (Far East), and several locations in the vicinity of Leningrad and Moscow. Details are lacking and in some instances the place names themselves are not yet on the map.

Gas Developments

Strange as it may seem, until this year natural gas did not figure as a separate item in the official "balance sheets" of mineral reserves of the Soviet Union. Only the estimates of individual geologists are available. They estimate total reserves at between 700 and 900 billion cubic meters, but proved reserves, i.e. those immediately available for industrial use, amount to only 50 billion cubic meters. A considerable part of the calculable reserves are in the oil fields. In fact, the search for gas fields as such has been rather backward until recently, and although the reserves in such sources are estimated at 375 billion cubic meters, only 17.5 billion cubic meters have been proved.

There is, of course, a gas industry in existence—it is small only in relation to the needs of the country and to its reserves. In 1939, 2.9 billion cubic meters of gas were produced in the oil fields, supplying dozens of enterprises, power plants, cities and villages.

The gas problem has become acute because of the multiplied importance of natural gas, or of its components, in the manufacture of octane gasoline, and large-scale developments are now going on in this field. One of the most pressing questions is the "hermeticizing" of the oil fields—the trapping of gases at the casing head and in the pipeline and tank-farm installations, to eliminate gas waste and the loss of volatile ends. In this connection a prohibition has been placed on new drilling unless gas traps are in place and gas lines laid beforehand. New gas fields, ready for exploitation, are noted in Dagestan, western Ukraine, Izhma (near Ukhta) and various other spots in the Ural-Volga regions. Gas lines under construction in Dagestan, and to be completed in 1941, will have an annual capacity of 200 million cubic meters. The Izhma field in the north is of enormous interest: the daily potential of each well in the field is reported to be equivalent to 1,000 tons of crude oil! Full utilization of these reserves depends on the projected construction of a 950-km. gas line to Molotov City and Izhevsk, with a billion cubic meters annual capacity.

Other Sources of New Production

A considerable volume of new production has been achieved in the settled Caucasian fields (Baku, Grozny, etc.) through the rehabilitation of long-standing shutdown wells, strippers and inactive wells. Hundreds of stripper wells and nonproducers in the established oil regions of the south, plugged back to shallower pays, have become good producers, in many cases, as at the Molotov fields in Baku. This work is going on in connection with an intensive well-investigating campaign. Whether this involves inspection of old drilling records or current logging, or both, is not stated, but it may be that this procedure harks back to the "snizu-verkh" (from-below-upward) system of exploitation drilling, widely adopted in the early 30's, under which the shallower sands were cemented and the hole carried to the deepest pay formations known If so, the deeper sands having been exhausted, they are now coming to the logical second phase of the snizu-verkh idea. At any rate, plugged-back wells throughout the Caucasian oil fields are now yielding hundreds of tons of new production daily.

The rehabilitation of shutdown wells has also given good results in 1939 and this year, but the proportion of restored wells to the total number of shutdowns is still small, or at least was in the first half of 1940. It is too soon to judge whether this work is giving important absolute increases in production. The trouble is that many of these shutdowns are due to neglect of breakdowns in production or in exploitation drilling in favor of new drilling. The existence of an unconscionably large number of such wells may account for the fact that, to quote an official source, "the tempo of advance in oil production has somewhat slowed up lately," in spite of new discoveries. If, with the rehabilitation of potential producers, the practice of neglecting breakdowns in current drilling is also being eliminated, the result can very quickly be a sharp increase in output. It is estimated that the annual potential of shutdown wells at Baku alone is in the neighborhood of 5,000,000 tons.

Estonian Production

Another source of new production is the Estonian shale deposits coming within the Soviet Union this year. The Estonian shale-oil industry is the largest in the world, having passed Scotland in 1938. Reserves are estimated at 5,000,000,000 metric tons, distributed along the coast of the Gulf of Finland from Tallin to Narva. Discovery of similar shales recently in the Leningrad area extends these beds eastward and of course enlarges the reserve picture.

The Estonian shales are high grade, containing 43 per cent of combustible substances. Distillation yields crude shale oil which is used as fuel in industry, and by railroads, power plants and gas

(Continued on Page 280)

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Four Areas in Brazil Warrant Petroleum Investigation

By FRANCIS N. BOSCO

The author of this story on Brazil's petroleum outlook is a graduate of the department of petroleum engineering, Colorado School of Mines at Golden.

He has engaged in petroleum engineering work in the United States and recently returned to this country from assignments in Venezuela and Brazil which lasted a year and a half.

THE search for petroleum in the relatively limited prospective sections of Brazil was pushed this year with augmented, though still restricted, financial support of the national government. The 1940 budget provided approximately $1,250,000 for exploratory drilling on the coastal shelf in the easternmost portion of the country and for primary investigation of prospective sections. There are four areas in Brazil which have attracted investigation (Fig. 1). These are, in the order of their probable importance:

1. The coastal shelf, a narrow strip, less than 25 miles average width, which parallels the Atlantic Coast north of Bahia for approximately 140 miles.
2. The Parana basin.
3. The Central Amazon Valley.
4. The Upper Amazon Valley, known as the Territory of Acre.

Shortage of inexpensive and efficient fuel has been an incentive of paramount importance behind the petroleum exploratory campaign of the past few years in Brazil. The country contains some of the largest iron-ore reserves in the world, but fuel consists of wood, inferior coal, bituminous shales and approximately 10,000,000 bbl. a year of petroleum imports.

The first exploration in Brazil was started in 1892 by E. F. de Camargo, in the State of Sao Paulo. The active search for oil was renewed in 1919. The government-sponsored work in Brazil, which has a total area of 3,286,170 sq. miles and a population of 45,000,000, is being augmented by several domestic companies. The present constitution practically excludes foreign companies from exploring for oil in Brazil.

Coastal Shelf Geology

Bahia (San Salvador) is the center of active oil exploration at this time. The city has a population of more than 500,000 and prior to 1763 was the capital of Brazil. The city is built across a fault scarp which naturally divides it into upper and lower portions. The city is the center of the cocoa and tobacco trades and large quantities of piassava, rubber and coffee are exported from this point.

The fault extends northward from Bahia and on the west, or downthrow side, lies the sedimentary area of interest for petroleum exploration. Extensive geophysical studies are being conducted from the area near Bahia north to Recife (Pernambuco) and this is the territory now receiving exploratory drilling attention.

In general, the area comprises a relatively narrow shelf of Cretaceous sediments, principally lacustrine, dipping under the Atlantic Ocean. Surface geological methods have been used to map the features near Bahia. The northern part of the area under discussion is masked by unconformable Tertiary sediments, necessitating reliance on geophysical methods. The small wells completed so far in the vicinity of Bahia produce from the Cretaceous and from rocks of the same age as are productive in the important Comodoro Rivadavia field in Argentina.

The discovery well was drilled slightly northwest of the Bahia city limits and a few hundred feet downdip from the "Lobato" oil seep. Results of the first wells drilled at Bahia are tabulated here:

Well—	Depth	Production*	Method	Status
Lobato 1 (discovery	1,150	20-50	Pumping	Waiting on equipment
Lobato 2	1,181	100	Pumping	Waiting on equipment
Lobato 3	....	....	....	Drilling

*Estimated barrels daily.

Dr. Nero Passos and Dr. Decio Odoni examining a core taken at 1,900 ft. in a Bahia test

Map showing possibilities of oil in Brazil. (Modified by the writer, after A. I. de Oliveira's map of 1938)

CRETACEOUS STRATIGRAPHY AT BAHIA

(According to Dr. Glycon de Paiva and Dr. Irnack Amaral)

Formation—	Thickness (in meters)	Description—
Upper horizon (No. 9)	?	Sandstone, shales, sandy limestones (surface).
Unconformity	..	
Bocca do Rio	?	Ash-like sands with limestone concretions.
Horizon No. 8	6	Sandy shale with sandy limestone.
Bomfim shale	9	Shale with stringers of sandy limestone.
Pedra Furada	10	Limonitic sandstone, with lignite.
	6	Green micaceous sandstone with lignite.
Agricultural School shale	30	Red shale, alternated with green calcereous and micaceous sandstones. Fossils numerous, including Melania sp., Paludina sp., Planorbis sp., Unio sp., Lepidotus, etc.
Agricultural School conglomerate	35	Conglomerate composed of a matrix of sandy shales.
Monserrate sandstone	8	Sandy shale, somewhat limy.
Monserrate conglomerate	21 to 45	Conglomerate of flint and boulders in a sandy matrix.
Bahia gneiss	..	Gneisses, basement rock.

AMAZON BASIN STRATIGRAPHY

Cenozoic

Formation—	Description
Recent	Surface sands, sandy clays, etc.
Pleistocene	Alluvial deposits of the Amazon
Unconformity	
Upper Pliocene:	
Quixito	Lacustrine clays and sands with numerous fossils
Lower Pliocene:	
Barreiras	Clays and sands, poorly consolidated
Unconformity	
Miocene:	
Pirabas	Limes and sandy limestones, fossiliferous

Mesozoic

Upper Cretaceous:	
Paituna	Sandstones
Parecis	Sandstones, with thin chert and flint beds
Unconformity	
Jurassic	Basalts and diabases
Unconformity	

Paleozoic

Carboniferous:	
Uralian	Limestones with flint, sandstones and variegated shales, some fossils
Unconformity	
Devonian:	
Onondagoan:	
Curua formation	Black shales and sandstones
Helderbergian:	
Maecura formation	Sands and shales
Silurian:	
Trombetas formation	Ashy shales with fossils
Pre-Cambrian basement	Quartzites, felsites, and phyllites, etc.

The total estimated thickness is in excess of 1,500 ft., to the basement.

Exploratory drilling in the Bahia area is under the supervision of the Drilling & Exploration Co. of Los Angeles, Calif., and Dallas, Tex.

The Parana Basin

The Parana Basin is a structural syncline, measuring 800 miles from north to south and 600 miles from east to west, corresponding to the drainage basin of the Parana River. The basin contains a probable maximum thickness of 5,000 ft. of Cretaceous, Permo-Triassic and Devonian formations, including volcanics and intrusives. These beds rest on a floor of pre-Cambrian crystalline rocks, which rise in the west to form the Paraguayan shield, on the north to form the Brazilian shield and on the southeast to form the "Coffee Plateau" of Sao Paulo.

The Coffee Plateau rises to an elevation of 3,000 ft. within a few miles of the coast, then slopes gradually to the northwest. The plateau area is the industrial center, the major coffee, cotton and agricultural section. Population is concentrated in the plateau section. The city of Sao Paulo has 1,250,000 population.

The Parana Basin has been explored by 38 government-financed wells and a few core holes have been drilled in the territory in search of coal beds, all of which have contributed stratigraphic data. Months of field work, personal communications from H. W. C. Prommel, Dr. Glycon de Paiva, Dr. Irnack Carvalho de Amaral, Dr. Nero Passos, Frank Rohwer and others and perusal of the literature develops the conclusion that the basin offers less attraction than the coastal shelf. The conclusion is based on: (1) The lack of commercial accumulations of oil in exploratory wells; (2) the limited number of oil seeps, particularly as compared with those found in the Tertiary sediments of Mexico, which are also crossed by intrusives; (3) the extensive igneous intrusions and extrusions.

The largest single intrusive-extrusive mass known in the world is a notable geologic and physiographic features of the Parana Basin.

The author found sills, dikes, laccoliths, xenoliths, stocks, and variations of these, with interconnections in the area studied. Oppenheim[9] considers that batholiths also may be found in this area.

Parana Basin Conclusions

Deep exploratory wells will be required to definitely determine the Parana Basin's possibilities. Locations may be selected on the crests of the numerous anticlines, if possible on those which are free from intrusions and faults.

Central Amazon Valley

The Central Amazon Valley marks the approximate limits of a structural syncline, 800 miles wide, bounded on the north by the Guiana Highlands and on the south by the Brazilian shield. The basin contains Cenezoic, Mesozoic, and Paleozoic sediments with several unconformities.

The Territory of Acre

The upper Amazon Valley area, adjacent to eastern Peru and the sub-Andean shelf, is designated in Brazil as the Territory of Acre. The area is potentially oil productive. Favorable structural conditions have been reported, and one or two of these have been partially tested by single wells. The stratigraphic section includes Tertiary, Cretaceous (?), and some Paleozoic formations.

STRATIGRAPHY OF THE PARANA BASIN

Age	Series	Formation and remarks	Estimated thickness (ft.)
Cretaceous	Bauru		(?)
Triassic, (Rhaetian)	Sao Bento	Serra Geral (eruptives and intrusives), Botucatu (aeolian sandstones), Rio do Rasto (Pirambola)	600
Lower Triassic	Passa Dois series	Iraty bituminous shale	850
Permian	Tuberao	Palermo	850
	Tatui	(?)	
		Rio Bonito (sandstone, dark shale)	
	Itarare	Glacial tillites and false tillites, etc.	2,000
Devonian	Parana	Tibagi sandstones	200(?)
		Ponta Grossa shales, Furnass (Faxina) standones	
Unconformity			4,500
Pre-Cambrian	Brazilian complex	Crystalline, etc.	

(Modified, after Chester Washburne and after Victor Oppenheim)

The intrusives which, at the surface, form the Serra Geral, may be found at any depth in the stratigraphic sequence.

STRATIGRAPHIC SECTION ON EAST AND WEST SIDE OF PARAGUAYAN SHIELD[9]

Ages—	Brazilian Standard White, 1908	Bolivian Standard Y.P.F.B., 1937	Argentine Standard Schlagintweit, 1937
Cretaceous	Bauru	Dolomitic limestone	Dolomitic limestone Red sandstones, calcareous
..... hiatus			
Rhaetian	S. Bento series	Lower massive sandstone	Lower red sandstones
Triassic	Passa Dois series		
Permo-Carboniferous	Itarare series	Sandstone and Tillite or Gondwana beds	Tillite
Devonian	Parana series	Micaceous shales	Paleozoic beds
Pre-Cambrian	Brazilian complex		

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A COMPARISON OF EXTRUSIVE MASSES

Location—	Area (in sq. mi.)	Thickness (ft.)	Remarks
Brazil, between Lat. 18-33° S., Long. 49.30-59°W.	450,000	900	Eruptives of Serra Geral Permo-Triassic
Africa, between Lat. 26° and 33° S.	330,000	2,000 max.	Karroo series
Oregon	200,000	4,000 max.	.....
Deccan, India	200,000	2,000	.....
Greenland	?	3,000 max.	.....

These data from References 4 and others.

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Barge Developed for Servicing Wells in Lake Maracaibo

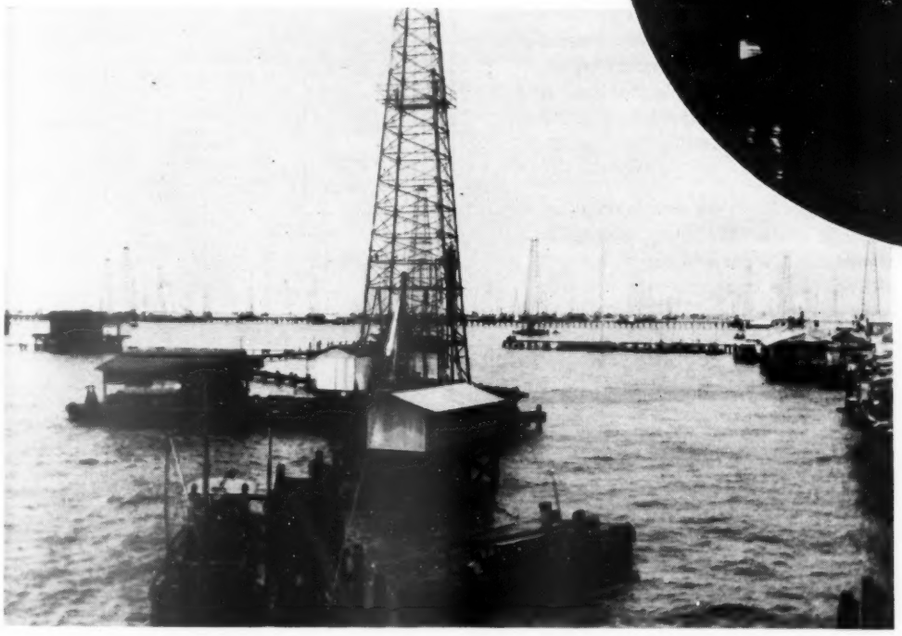
By L. ALCALA SUCRE
Production Engineer, Mene Grande Oil Co.

IN addition to routine servicing of surface installations, the common types of operations performed on wells in the Lagunillas field are, in order of frequency of occurrence, as follows:

1. Rod and tubing jobs.
2. Cleanouts.
3. Pump replacement.
4. Standing valve depth adjustments.
5. Washing of screen liners.
6. Back plugs.
7. Placing of insert liners.

When the number of wells on the beam was few, each pumping producer was provided with the individual equipment necessary to perform these various operations, but the steadily increasing number of pumping wells made it economically advisable to provide mobile servicing units. These mobile units were to eliminate the combined cost of individual stationary equipment and floating transportation to deliver other necessary items such as blocks, rod and tubing lines, etc.

The picture at right shows a deck view of the cleanout barge in action. Below, the cleanout barge is seen in operation in the Lagunillas field



The Lagunillas field is situated on the eastern shore of Lake Maracaibo in the State of Zuila, Venezuela. A strip approximately 12.5 miles long and 0.4 mile wide in the lake proper is currently being exploited by the Mene Grande Oil Co. Of the 239 active producers situated in this area, 233 are pumping wells varying in depth from 3,000 ft. to 5,500 ft.

From July 1932, date of initial beaming operations, to late 1934, each pumping well in the field was provided with stationary equipment sufficient for the most common subsurface jobs. This equipment consisted of a two-speed one-drum draw works powered by the electric motor of the pumping unit from a power takeoff on the reduction gear. Additional equipment, such as tubing and bailing lines, traveling blocks and miscellaneous rig irons were delivered to the location on launches or other suitable means of floating transportation. When by December 1934, 91 wells had reached the end of their flowing life, it became evident that the individual-equipment system was rapidly becoming economically impractical, and early in 1935 the practice of servicing wells with equipment installed on barges was adopted.

Development of the Cleanout Barge

The first cleanout barge to see service in the Lagunillas field was equipped with a two-drum hoist powered by a 25-65-hp. electric motor which was soon supplanted by a 60-hp. wound-rotor induction, reversible-control motor. The use of this barge was, however, limited by the very nature of the driving power for the draw works since power lines did not extend to early-day gas-lift wells on which the barge was also used for servicing. Furthermore, even at locations provided with electricity, subsurface operations were delayed by power interruptions occasioned not infrequently by violent electrical storms.

Delays due to power interruptions were subsequently eliminated by the installation of gasoline-driven engines, which in turn were finally supplanted by 80-hp. to 120-hp. diesel motors. No major changes in equipment other than draw-works engine took place until very recently when one of the four cleanout barges currently assigned to the Lagunillas field was equipped with a two-drum hoist having air-operated friction clutches in the lower drum, manually operated clutches in the upper drum and circulating-water-cooled brake flanges.

The deck plan of all barges is practically the same and is illustrated in the accompanying schematic diagram. While the equipment and its arrangement is similar on all barges, the physical dimensions and characteristics vary somewhat as indicated by the following table:

Barge No.	Material	Dimensions (ft.)	Draft when loaded (in.)
1	Steel	100x22x5	22
2	Steel	80x34x6	24
3	Steel	80x34x6	25
4	Steel	80x40x5	19

The draft is particularly important since a variation of an inch or two frequently is the determining factor in the selection of a barge suitable for locations in very shallow water.

All cleanout barges are towed either by tug

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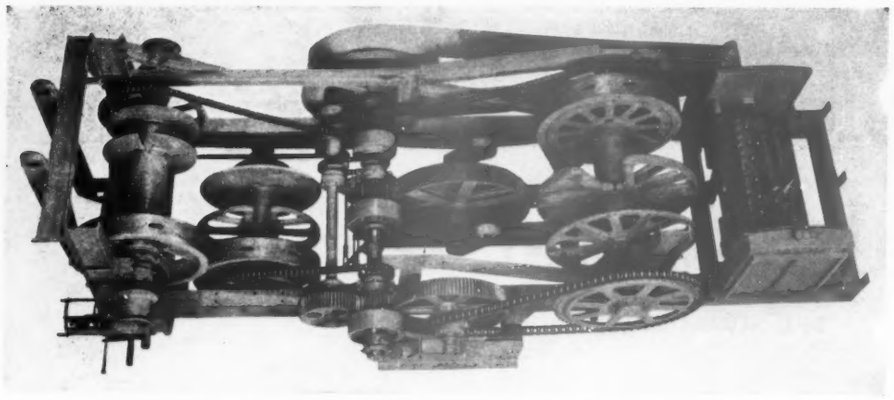

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Star offers you a complete line of portable, all-steel spudders which excel for new drilling, tailing-in after rotary, and clean-out work, to depths of 6,000 feet. They bring you such money-making features as:

Chain-driven, free-running reels; air-cooled brakes; traveling spudding sheave; double-arm, shockless wire line spudder, adjustable for new drilling or clean-out work; instantaneous reverse; multiple speeds; anti-friction bearings; telescoping mast with roller bearing sheaves and with mud sill; electric welded frame.

The *new* 76 Star Spudder has all these features. It moves fast, shows a good profit. Precision-built, it has a ruggedness fitting it for lifetime service. It has a new drilling capacity of 2,500 to 3,500 feet and handles up to 4,000 pounds of tools.

The *new* No. 82 Speed Star is ideal for clean-out work, swabbing, tailing-in, for drilling deeper and top-to-bottom drilling. It is conservatively rated to handle 2,000-foot clean-out work.

You'll find an efficient, modern Star Drilling Machine for every purpose. The smaller sizes are available for mounting on truck or trailers with either steel or rubber-tired wheels. The larger sizes are supplied in trailer models, as well as in self-moving models with crawler wheels. Detailed literature will be furnished on request.

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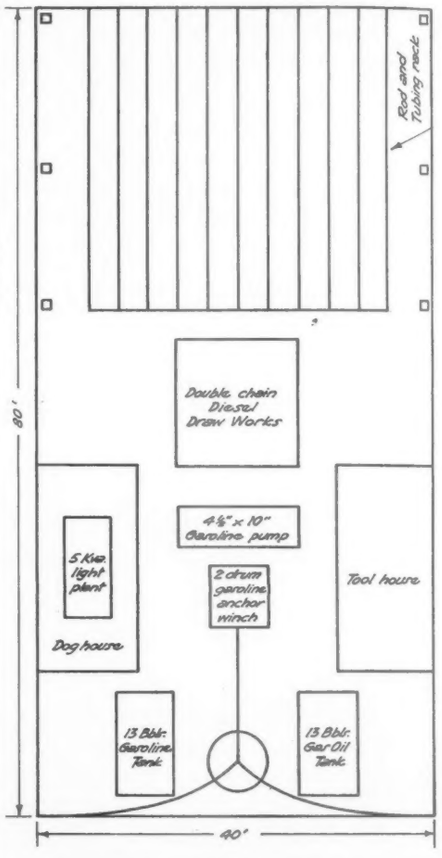
boats or launches and come into the location on the V side of the derrick. Two 750-lb. anchors are dropped off the stern end and, forward, an equal number of lines are looped around two corner fender piles located very close to the foundation piling. The cat line is used to bring the bow of the barge properly into position against the fender piles while the stern is aligned by means of the two anchors.

Well Servicing at Night

All cleanout barges are equipped with individual light plants to generate power for all lights on the derrick and on the barge itself. The standard plant consists of a 5-kva. single-phase gen-



Schematic diagram of deck plan of barge

erator equipped with an automatic voltage regulator and a four-cylinder gasoline motor. In addition to 25 60-watt lamps on the derrick light string, there are 10 60-watt lamps and two 300-watt floodlights on the barge. One of the floodlights is located on the bow of the barge and the other diagonally opposite on the stern—both lights being movable so as to permit maximum illumination wherever necessary.

Each barge carries a well-servicing crew composed of one well puller, three floormen and one derrick man, all of whom are Venezuelans. The local practice of employing three rather than two floormen is made necessary by the situation of the draw works which, being on the barge itself and not less than 40 ft. away from the derrick floor, makes it extremely inconvenient for the well puller to assist at any time when two men alone are unable to break loose a tight connection. One of the three floormen is called a "headman" and receives a slightly higher remuneration than his two companions because he is responsible for the execution of the well pullers' orders. All cleanout barges are on duty throughout every day of the 6-day working week and the 12 five-men Venezuelan crews working 8-hour

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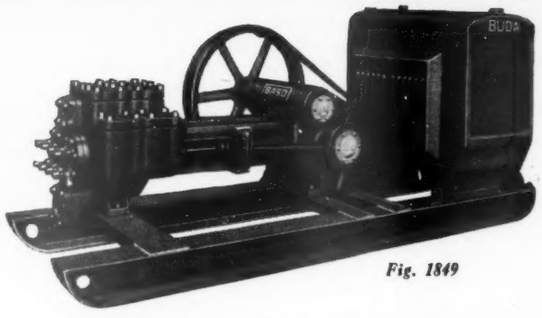


Fig. 1849

SERIES 1800—POWER PUMPS

GASO Figure 1849 Pump is adaptable for any service such as water lines, gathering systems, booster stations, or acidizing. Light in weight, compact and complete, it is ideal to meet conditions in declining fields or on smaller leases. Pump is illustrated with gas or gasoline engine drive.

The same features will be found in this pump as in models of much higher price. Crankcase is enclosed and provides a reservoir for holding oil bath which lubricates the gears, crossheads and connecting rod bearings. Main and pinion bearings are Timken Tapered Roller Bearings, enclosed in cast iron housings and sealed off from crankcase. Timken bearings are oiled from outside, one filling sufficing for months of steady operation.

Fluid ends are interchangeable liner type. We can furnish special alloy steel liners or bronze liners for specific service; also all-acid-resisting-bronze fluid end for acid service. Pump can be arranged for any type drive. Cylinder sizes 2½"x6" to 4"x6".

FIGURE 1844 and 1849

Size	DISPLACEMENT		Pounds Working Pressure	R.P.M.	Pipe Size		Pump Fig. No.
	Gallons Per Min.	Barrels per Hr.			Suc., In.	Dis., In.	
2½x6	32	46	900	70	4	2	1844-1849
3 x6	47	67	600	70	4	2	1844-1849
3½x6	65	93	450	70	4	2	1844-1849
4 x6	88	126	350	70	4	2	1844-1849

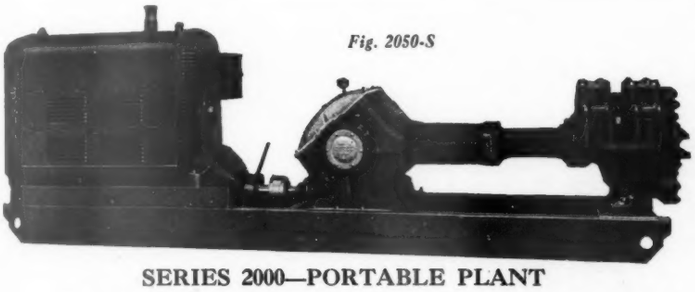


Fig. 2050-S

SERIES 2000—PORTABLE PLANT

GASO Series 2000 Portable Pumping Plants, mounted on trailers or skids, are particularly adapted for emergency, temporary or semi-permanent oil field service, such as water lines, gathering systems, booster stations and pick-up service.

Pumps have the recognized Gaso features, including enclosed crankcase, working parts running in oil bath and Timken Bearings sealed off from crankcase. Figures Nos. 2019 and 2050 have fluid ends with interchangeable liners in sizes from 2½" x 10" to 5" x 10". Fluid ends on Figure 2017 pumps, available in either 6" x 10" or 7" x 10" sizes, have rolled-in brass liners.

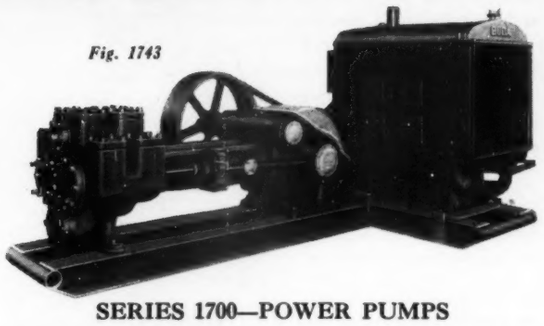
Power unit is 4-cylinder, extra heavy duty oil field type engine, of medium speed, burning natural residue gas or gasoline.

Smaller portable units are available in the Gaso line in our Series 2200 Pumping Plants, with capacities from 46 to 126 bbls. per hour.

FIGURE 2017-2019 and 2050

Size Pump	Displacement		Working Pressure	R.P.M.	Size Pipe		Pump Fig. No.
	Gals. per Min.	Bbls. per Hr.			Suc.	Dis.	
2½"x10"	41	59	1000	54	4"	3"	2019-2050
3" x10"	61	87	700	54	4"	3"	2019-2050
3½"x10"	85	122	500	54	4"	3"	2019-2050
4" x10"	113	161	400	54	4"	3"	2019-2050
4½"x10"	144	205	300	54	4"	3"	2019-2050
5" x10"	179	255	250	54	4"	3"	2019-2050
6" x10"	259	371	175	54	6"	4"	2017
7" x10"	355	508	125	54	6"	4"	2017

Fig. 1743



SERIES 1700—POWER PUMPS

These pumps are designed to pump oil or water through long lines at pressures from 300 to 1400 pounds. Are admirably suited for pumping large capacities at high pressures, having fluid ends with interchangeable liners from 2½" to 5" and from 5" to 7½" x 10" stroke.

These pumps possess all of the recognized GASO features. Crankcase is fully enclosed, and working parts operate in oil bath. Both pinion and crankshafts are journaled in Timken Tapered Roller Bearings sealed off from the crankcase. Fluid ends can be furnished with special alloy steel liners, chromonized, or cast iron liners, bronze lined. All pumps are standard brass fitted, with steel piston rods. We can furnish any type of valve construction. Pumps can be arranged for any type drive: (1) Pulley for belt drive, (2) direct connected to engine through flexible coupling, (3) electric motor through chain or reduction gears, (4) "V" Belt drive to electric motor or multiple cylinder power unit.

FIGURE 1740-1741-1742 and 1743

Size Pump	DISPLACEMENT		Working Pressure	R.P.M.	Pipe Size		Pump Fig. No.
	Gal. per Min.	Bbl. per Hr.			Suc.	Dis.	
2½"x10"	38	54	1400	54	4"	3"	1740-1742
3" x10"	57	82	1400	54	4"	3"	1740-1742
3½"x10"	81	116	1200	54	4"	3"	1740-1742
4" x10"	109	156	925	54	4"	3"	1740-1742-1743
4½"x10"	140	200	725	54	4"	3"	1740-1742-1743
5" x10"	175	250	600	54	4"	3"	1740-1742-1743
5" x10"	175	250	600	54	6"	4"	1741-1743
5½"x10"	213	305	500	54	6"	4"	1741-1743
6" x10"	255	365	400	54	6"	4"	1741-1743
6½"x10"	301	431	350	54	6"	4"	1741-1743
7" x10"	351	502	300	54	6"	4"	1741-1743
7½"x10"	405	578	260	54	6"	4"	1743

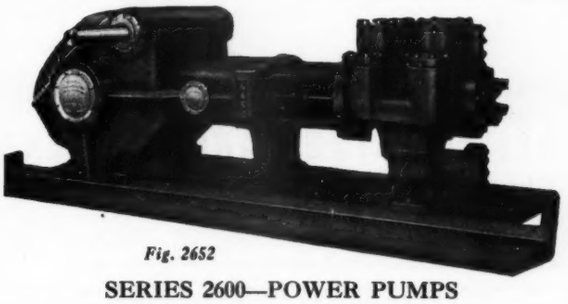


Fig. 2652

SERIES 2600—POWER PUMPS

Our GASO Fig. 2652 12"-stroke pump, has approximately *double* the capacity-pressure rating of any other GASO model.

The GASO features of design which have become familiar throughout the industry are incorporated in this unit. Main gear is semi-steel, Herringbone construction; pinion gear is forged steel. Crankshaft is journaled in Timken Tapered Roller Bearings and pinion shaft in Hyatt Roller Bearings, sealed off from the crankcase. Fluid end is of side-pot type with all valves individually accessible. Any type drive can be supplied.

Fluid cylinders of interchangeable liner type, providing range in cylinder diameter of 4" to 7¼"—give the pump a capacity ranging from 176 bbls. per hour at 1500 lbs. pressure, to 637 bbl. per hour at 475 lbs. pressure.

FIGURE 2652—SIZES, CAPACITIES AND PRESSURES

SIZE	DISPLACEMENT		Working Pressure	R.P.M.	PIPE SIZE	
	Gallons per Min.	Barrels per Hr.			Suction	Discharge
4" x12"	123	176	1500	54	8"	4"
4½"x12"	161	230	1225	54	8"	4"
5" x12"	202	289	1000	54	8"	4"
5½"x12"	248	355	825	54	8"	4"
6" x12"	300	428	700	54	8"	4"
6½"x12"	355	507	600	54	8"	4"
7" x12"	414	592	500	54	8"	4"
7¼"x12"	446	637	475	54	8"	4"

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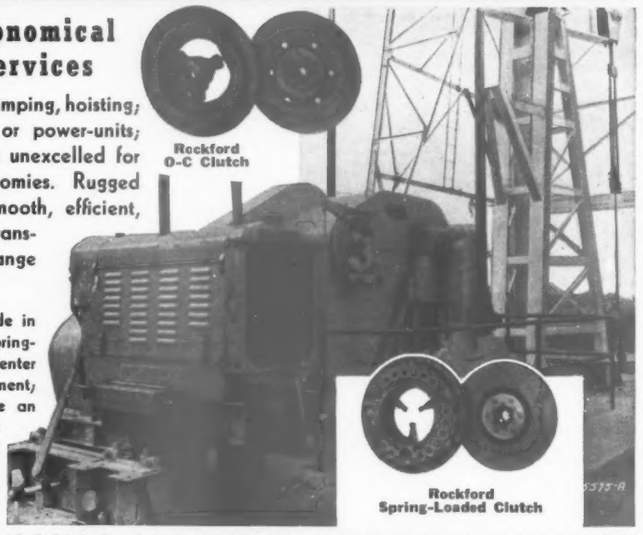

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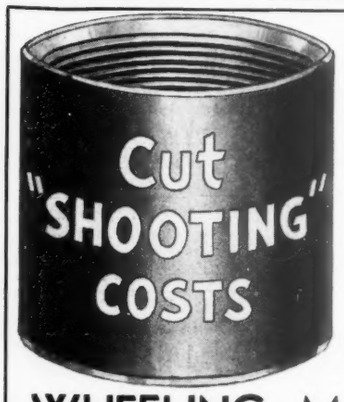

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BOILER TUBE O.D.	COUPLING O.D.	COUPLING LENGTH	THREADS PER INCH	TYPE OF THREADS	APROX. WGT PER 1000 PCS.
2	2.218	2 3/8	11 1/2	STRAIGHT	500 Lbs.
2 1/2	2.730	2 5/8	11 1/2	STRAIGHT	965
3	3.260	2 7/8	11 1/2 TO 8	STRAIGHT OR TAPER	1350
3 1/2	3.870	3 1/4	11 1/2 TO 8	TAPER	2125
4	4.300	3 5/8	11 1/2 TO 8	TAPER	2590

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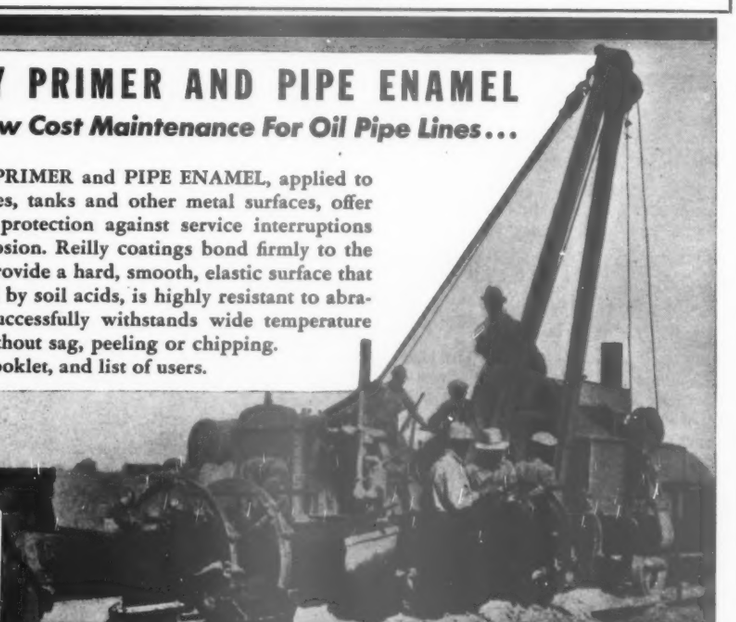

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tours are under the supervision of two American foremen.

Auxiliary Facilities

A certain amount of repair material such as extra rods and tubing are carried on each barge. A large lease launch is likewise provided and covers the field delivering such material to the well-pulling crews as is not available on the cleanout barges. One member of the crew of this service launch is an experienced skin and helmet diver and it is his principal duty to dive for tools and other material which, in spite of all precautions, may have fallen into water which in places is over 20 ft. deep. Contrary to the popular conception of the tropics and its dangers, this man has little to fear other than the natural hazards of his profession. Really dangerous amphibians, such as caimans and poisonous water snakes, have been seen in Lake Maracaibo but are very scarce, especially in the area under exploitation. Wounds of a minor nature are sometimes inflicted by catfish which are present in enormous numbers.

Operations at Shallow-Water Locations

Some locations in water ranging from 9 in. to 15 in. in depth are inaccessible to even the shallowest draft cleanout barge and servicing of these wells is carried out in one of the three following ways:

1. On wells with reduction gears and located in very shallow water a two-speed one-drum draw works is often in place and this equipment is used for subsurface operations.

2. Shallow-water wells equipped with pumping jacks that are not equipped to drive a draw works are serviced by cleanout barge which is brought to bear against two fender piles driven in deeper water at a distance varying between 50 and 100 yd. from the well. A narrow boardwalk connects the fender piles to the derrick floor and serves as the support for the tubing or bailing lines.

3. In some cases and at extremely shallow-water locations, where necessary facilities are available, the draw works and engine are removed from the barge and transported to the location on a flat car running on tracks supported by piles. This procedure is, however, followed only when operations requiring a rather lengthy period of time are contemplated.

Advantages of Over-Water Locations

The principal advantage of over-water locations in connection with well-servicing operations is in the possibility of installing all necessary equipment on one mobile unit which may be easily towed to any desired location. This is particularly important in this country where a majority of the roads are mediocre and companies operating wells on land sometimes experience difficulty in reaching the locations especially during the rainy season.

A secondary advantage of over-water locations during servicing operations is the plentiful supply of water available at all times. The 4½-in. by 10-in. power-driven pump on all cleanout barges draws water directly from the lake, thus facilitating such operations as washing of screen liners, killing of wells, and washing of the barge itself. This pump is likewise used for fire-fighting purposes.

Still another advantage afforded by the location of derricks on over-water foundations is that no rod board is necessary. Thus when pulling rods the regular tubing board is used as a rod board and it is still feasible to hang 90 ft. of rods in a 122-ft. derrick. This procedure is made possible by the fact that from 10 to 15 ft. of space is available between the derrick floor and the lake level and the ends of the rods are allowed to hang in this space.

Y.P.F. Services to Oil Industry Cover Wide Range

Y. P. F. bachelor headquarters at Comodoro Rivadavia

THE activities which Yacimientos Petroliferos Fiscales performs for the petroleum industry and trade in the Argentine Republic comprise an integral operation from exploration to the marketing of products.

For this reason, Yacimientos Petroliferos Fiscales undertakes intensive geological and geophysical studies and surveys in search of favorable structures; investigates oil-bearing conditions of the subsoil through drilling; exploits, in a conservative manner, four oil-producing sands, located in the provinces of Mendoza and Salta, and the territories of Chubut and Neuquen; transports in its own fleet of tankers the entire production of the Comodoro Rivadavia (Chubut) wells and processes petroleum output in refineries located in the most populated and industrialized sections of the country, taking charge of the distribution and sale of the refined products.

Geological and Geophysical Research

This research work is being undertaken in accordance with an established plan covering the different regions of the country. Engaged in this work are four geological parties, four seismograph parties and three gravimeter parties. In view of the provisions made for the research of this character for 1941, it will be necessary to increase to six the number of geological parties and to six that of the seismograph parties.

Drilling Activity

At the end of the year there will be 52 rotary rigs, five of which are portables, and provision has been made to increase the total to 58 the early part of 1941.

As an index to the operations performed with a monthly average of 22 rigs engaged in drilling test wells and 22 engaged in producing wells, the total drilling during the 10 months of the year ending October 31, amounted to 262,290 and 324,895 ft., respectively. During the same period, 59 test wells and 90 producing wells have been completed. The average depth of test wells was 4,445 ft. and of producers 3,610 ft.

The deepest well ever drilled in this country is in Mendoza. It is the LC1, having reached a depth of 9,350 ft. the early part of November.

In order to secure the best possible results in the handling of wells, Yacimientos Petroliferos Fiscales follows closely every innovation in the matter of tools and methods of drilling, adopting those which prove most successful under local conditions.

For this reason, the trend now is toward the least possible utilization of core samplers, in order to reduce the time lost in running and pulling the equipment.

The trend results from the fact that in certain known oil-bearing horizons, the electric log registers such a certainty of interpretation that it proves true in more than 90 per cent of the expectations concerning the contents of the strata. In cases of doubt, there still remains available the wall-

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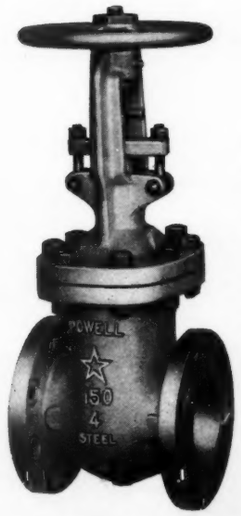

FIG. 1503—CAST STEEL

As in all Powell Cast Steel products, here is a valve of improved design, assuring long, safe, and dependable service. All vital working parts are produced to gauge, are interchangeable, and of equal wearing quality. Guide-ways for wedges in gate valves are accurately machined to given dimensions; seat faces are machined in direct relation to these guide-ways; special form of thread of more than ample length holds rings securely; special attention to pitch of threaded sections on stems; bonnets designed with same wall section as bodies; non-corrosive packing-glands . . . these and other features, many entirely exclusive with Powell, account for the better performance you can count on from this particular valve in Refining service.

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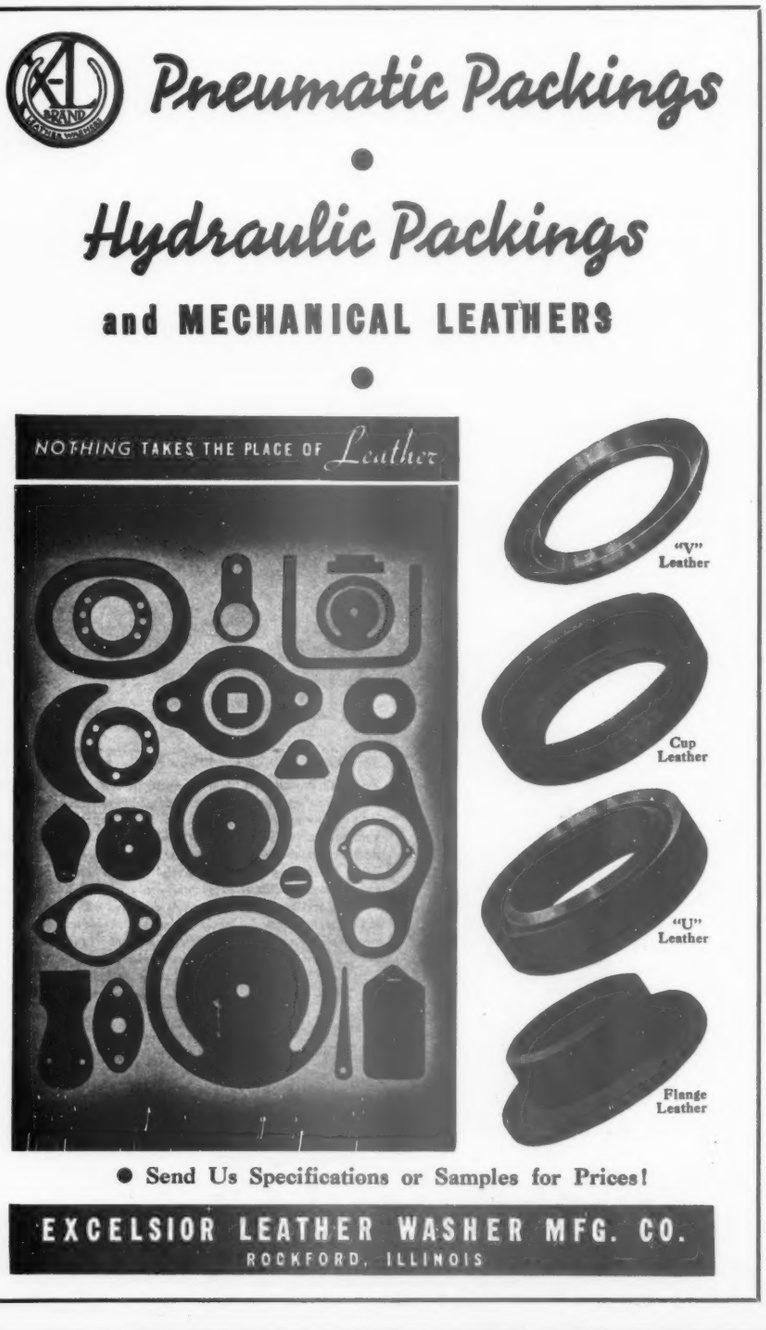


sampling method, which has often been used when drilling through stratigraphic formations of unknown character. The face that a certain number of oil-bearing strata have been discovered in this manner, which would have otherwise passed unnoticed, has increased confidence in electric logging.

Wire-Line Coring Tools

The use of wire-line coring tools with rotary is increasing, but only in formations in which progress can be made faster than with the regular coring tools. Because of the reduced diameter of the cores secured by the wire-line method, samples are not suitable for saturation analysis. The wire-line tool is mostly used in stratigraphic zones and dense beds between oil-bearing horizons, and the regular type is used in the latter.

During the drilling, the verticality of the well is not overlooked, but is frequently checked with a clinograph. The load applied to the tool is carefully controlled and the speed of rotation of the turntable is regulated accordingly.

Because of the important role performed by the drilling mud, constant attention is given to its quality, including purity and colloidal condition. Tests for specific gravity, viscosity, stability and sand contents are made several times during the day, and results entered in a graphic log. With less frequency, tests are made of the effect of the mud upon the walls of the hole, including tests for the maintenance of the correct pH.

Controlling Mud Properties

Through careful control and the combination of all factors of mud conveniently handled, it is possible to maintain all the desirable characteristics in order that the mud may fulfill its functions in the best possible manner, according to existing conditions, types of rock penetrated, temperatures, gas and water reactions.

The correct cleaning of the mud is accomplished by passing it through screens of the vibrating type, and in zones of sandy soil centrifuges are installed for the separation of the fine grains which are not detained in the screens.

By following the above-mentioned precautions to insure the verticality of the holes and by drilling with the aid of suitable mud, sticking caused by sudden twisting and other reasons has been greatly reduced.

One Method Followed

One of the methods followed in Argentine fields is to drill to completion depth and then survey the hole by the electric method. The next step is to cement the casing through the oil-bearing formations penetrated. If the lower or bottom strata are water bearing, the bottom is plugged with cement up to the shoe or up to the lowest oil-bearing horizon. In some cases, the deepest zone is left exposed and slotted liner set. The pay strata are then tested by gun-perforating at desired intervals. In test wells, every stratum is tested either individually or in pairs if closely associated, provided little or no differences appear in their characteristics. On the other hand, in producing wells, which are drilled to exploit only one known oil-bearing horizon, it is customary to perforate at points embracing all the sands therein, excepting those suspected as being water bearing.

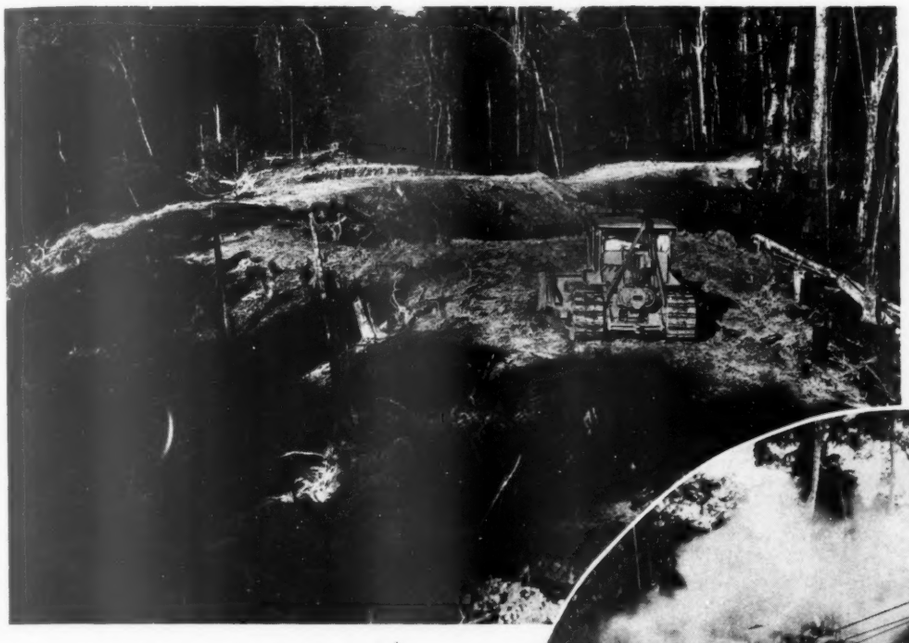
In the case of a complex oil-bearing section, the casing is cemented to bottom.

Directional drilling is chiefly followed in the Comodoro Rivadavia fields. Here, along the coast, drilling has been done under the ocean to formations that cannot be reached through vertical holes. Some have gone down, at maximum angles of 50°, as far as 1,864 ft. from the head of the well. Directional drilling has also been applied to completing wells under surface structures with satisfactory results, after overcoming serious problems.

Difficult Problems Encountered In Building Oil-Field Roads

By E. H. AUSTIN
Chief Engineer, Tropical Oil Co., El Centro, Colombia

Abundant rainfall, torrid climate and dense jungle vegetation are factors that bedevil oil companies in their road-building work in South American oil fields. Here is told how one company builds roads in Colombia.



Angledozer road builder with cable control, above, clearing out a road in dense jungle country of Colombia. Right: Highway-construction scene during early days

ONE of the most important phases in the initial development of an oil field in South American countries is that of road construction. This statement will no doubt be better appreciated if a brief account is first given of the early problems which confronted the Tropical Oil Co. because of the comparative isolation and climatic conditions of the area to which this article pertains.

The De Mares concession is situated in the Magdalena Valley in a latitude bordering on the Equator, and the center of operations is approximately 500 km. (about 310 miles) south from the Caribbean seaboard. When speaking of distance for purposes of comparison, however, it is necessary to consider its meaning in terms of transportation time. While 500 kilometers may not appear to be extreme in some parts of the world today, prior to 1920 the only means of access to this concession was by river boat. Transportation on the Magdalena River involved then and still does most of the uncertainties and difficulties encountered in river traffic such as the alternate periods of high and low water and the shifting currents and channels. Added to these natural difficulties there was the necessity of transferring cargoes from the river steamers to launches and even dugout canoes, which could navigate the Colorado River, one of the smaller tributaries to the Magdalena. Actually on routine orders, at that time, the delivery of materials and supplies from sources situated in North America required from 4 to 5 months' time from the date of requisition in the field.

A hot climate, low altitude, and a heavy rainfall are the essential characteristics of a typically tropical region and all these prevail in the vicinity of the De Mares concession. According to Tropical's records the annual rainfall since 1921 has averaged 115 in. and in the year of 1938 the maximum of almost 200 in. was reached. It may be readily imagined that an abundant rainfall in a hot climate is conducive not only to a dense jungle vegetation but also to various forms of insect life, some of which are disease carrying. One of the first problems, then, which confronted the pioneers in this field was that of clearing and draining certain areas on which to build camps in which the workmen might have reasonable protection from tropical diseases. The various sanitary measures which were developed and are now being practiced, however, will not be discussed here as sanitation constitutes a major problem in itself.

One of the first road projects on the concession was the building of 40 km. of tractor road from the river port of Barranca-Bermeja to well No. 1 at the Infantas camp. Since the entire distance traversed an extremely rough and broken terrain, which is also typical of the general area, most of the observation work was done on foot and supplies were carried on mule back. During the early reconnaissance work in the field a rather unique

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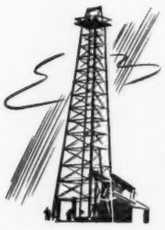

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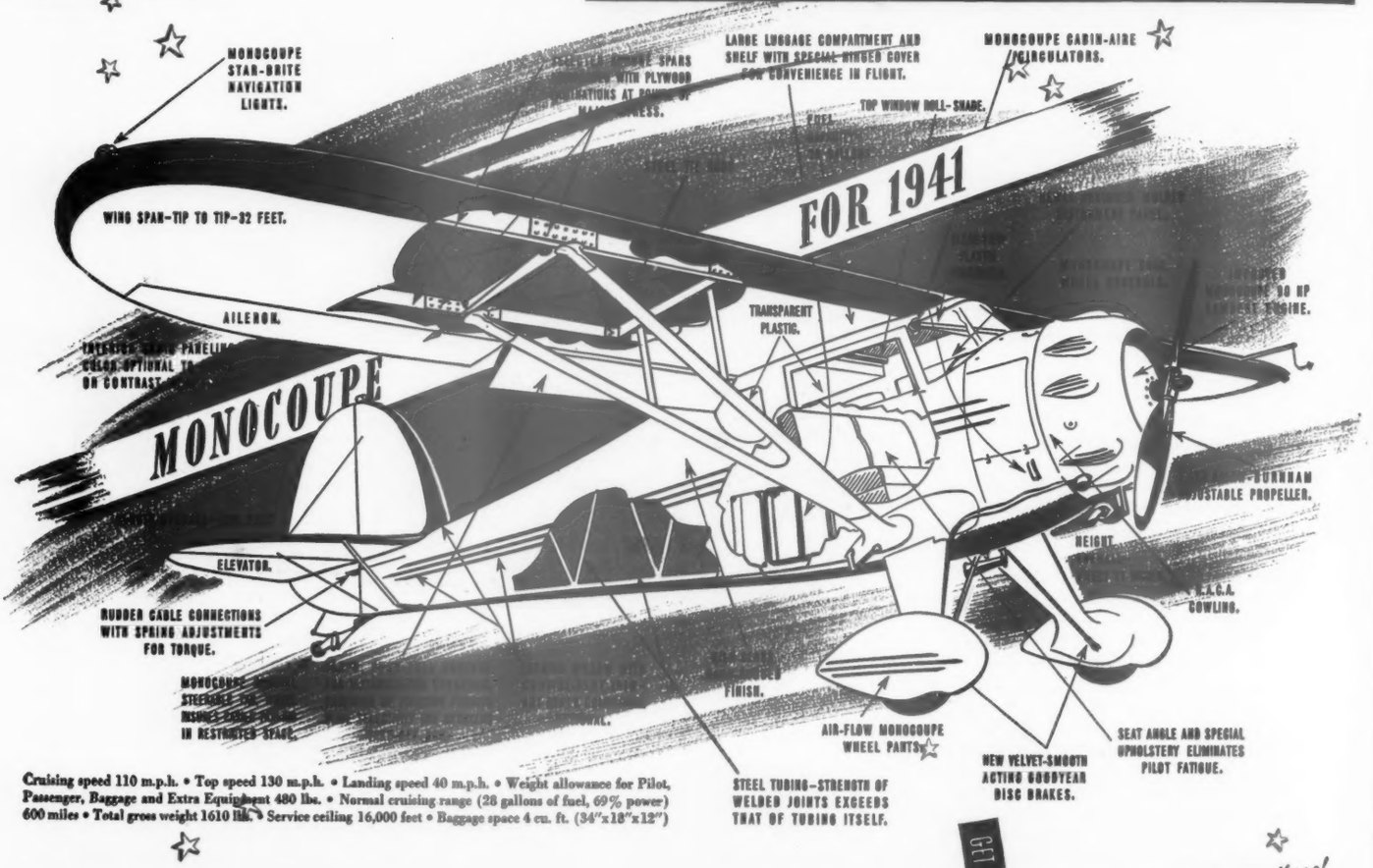
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Roadbuilder tractor, a bulldozer, both hydraulically controlled, and a carrimor

feature on the part of the mule was noted. It was observed that the average pack mule when carrying a load of approximately 200 lb. would, of his own volition, ascend a maximum grade of 16 per cent. When driven or forced to ascend steeper grades up to 25 and 30 per cent, the pack mule, in his stubborn way, would zig-zag from side to side but in no case would exceed the 16 per cent grade in a straight climb. Before the advent of roads both packs and saddle mules constituted an important means of transportation on the concession.

The pioneer road building was done entirely by hand. Large groups of earth-moving labor gangs using picks, shovels, and wheelbarrows were employed under contract. Soon, however, improved methods were adopted and a narrow-gage track with dump cars was utilized for moving the excavated earthwork. The rate of progress was still slow with these methods and the result was a narrow tractor road with steep grades and sharp curves. Culverts and bridges were constructed of wood cut and hewn in laborious fashion from native timber. During the rainy season, when the rivers and creeks were at flood stage, all transportation would be at a standstill until the floods subsided.

The need for mechanical equipment in road construction became readily apparent. In 1921 the first steam shovels were obtained and these, in conjunction with Decauville track and dump cars, supplanted the use of many shovels and wheelbarrows. The movement of earthwork from the excavations to the embankments was further facilitated by the use of iron-mule dumper tractors of 2-yd. capacity. Also, equipment for bridge erection and pile driving was obtained. Despite the improved methods of road building it was impossible to keep pace with the demand for new roads because of the rapidly expanding oil field. Each new location required not only a road but excavation and grading in preparation of the well site. Added to these were many miscellaneous requirements such as sites for tank batteries, industrial plants, new camps and many others. By 1930 there were seven power shovels operating in the field together with a fleet of dumper trucks. The use of the latter along with the iron mules eliminated the use of narrow-gage track.

Soil Conditions Peculiar

Soil conditions, while presenting some local peculiarities, are for the most part similar to those found in parts of Mexico and the American Northwest. Several varieties of clay are found but the covering of black top soil seldom reached a depth of more than 2 in., and frequently is not encountered at all. As a consequence the roots of trees of both hard and soft woods do not as a rule penetrate deeply into the soil but spread out near the surface to which they cling so tenaciously that the use of dynamite is necessary for their removal. During the wet seasons the red clays become very sticky and are difficult to handle, but on the other hand this type of soil is an aid in maintaining a steep slope occasionally as sharp as ½ to 1. In some places soft sand is encountered which is troublesome as it washes badly. Although there are numerous swamps they are generally shallow with a good clay bottom and as a result "sink holes" can be avoided. It is also a curious fact that scarcely any rain falls during the daylight hours but comes mostly between midnight and 6 a.m. While no actual tests have been made it is known that the bright sun accounts for a rapid rate of evaporation. As in other parts of the world it was learned through experience that it is better to work with nature than against her. The locating engineers learned to take advantage of the broken and undulating terrain by "rolling the grades," thus facilitating the runoff of heavy rainfall. Likewise, clearings on each side of a road are made of ample width so as to promote rapid evaporation and dry-

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A highway winding through the hills of the oil field

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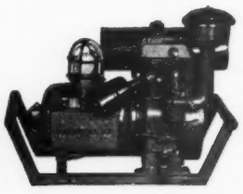

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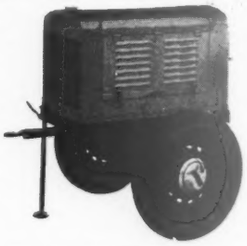
We also build larger sizes for portable service. Illustration to the right is a 5 KW, 4 cylinder, water-cooled unit mounted on a trailer.



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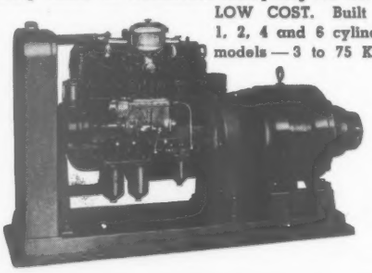

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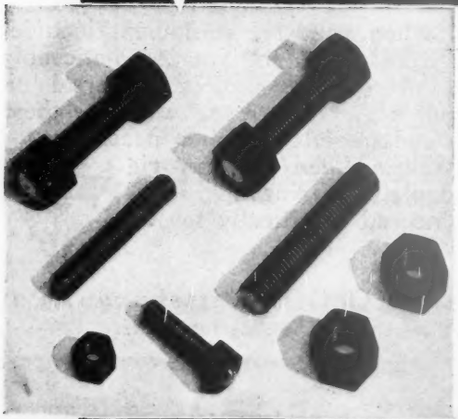

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ing by the hot tropical sun. These clearings are from 50 to 80 m. in width and the stumps, logs, and roots are removed for a width of 20 to 30 m.

About 1936 a radical departure in the Tropical's methods of road construction took place when the first caterpillar tractors equipped with hydraulically controlled bulldozer blades were obtained. This new cut-and-push system for handling earthwork proved so satisfactory in Colombia that additional units were purchased soon afterward. Further improvement came early in 1939 when larger tractors fitted with cable-operated blades were obtained, and also more specialized units such as carrimors and rippers. These highly mobile units are building good roads cheaper and faster. It has been found highly advantageous to operate these units in groups of three or four. In this way the work may be better coordinated and the necessary servicing of the machines is greatly facilitated. The servicing is carried out on a schedule as all the machines must be at all times well lubricated and greased and the transmission oil frequently changed because of the extreme heat. It has been determined that each of the large units has a capacity for an 8-hour working day of from 25 to 30 m. of finished roadway, 7 to 9 m. in width, including side ditches.

Clearing Done by Hand

The clearing of rights-of-way for roads is still done entirely by hand as this has been found to be the most practical. Many of the Colombian workmen are natural timbermen and are extremely proficient with the heavy-bladed axes and the inevitable machetes. They work in groups of five and six under the supervision of a foreman and are given contracts for clearing. Much of the timber is very hard and dense, some of the more common varieties being locally known as guayacan hobo, caming, canelo, magui magui, coco colorado, and punte. The wood of the first four types is used for railroad ties and for construction where heavy timbers are required. The punte wood is exceptionally well suited for piles in bridge building and for posts of all kinds.

As might be expected the keeping down of maintenance costs on several kilometers of road under adverse conditions of topography and rainfall presents a sizable problem. About 90 per cent of the main roads are on a graded subsoil consisting of a fairly stable clay although a few sections have been cut through a sandstone formation. The clay when used as a base has proved fairly satisfactory provided it can be protected from water saturation. As a surface, however, without being waterproof, the clay will not sustain heavy loads in wet weather and much less under a concentrated precipitation of 25 to 30 in. of rainfall during a single month which frequently occurs. Various attempts at surfacing were made using such materials as gravel and sandstone, and in other cases by scarifying and penetrating with a heavy oil of fuel-oil grade. None of these methods, however, proved very satisfactory. While the gravel surface on top of the clay subsoil resulted in an all-weather road a great deal of maintenance was required due to its being dislodged and scattered by the traffic of trucks, tractors, and other equipment. Both the gravel and sandstone surfaces also tended to form a dust nuisance during the intermittent periods of dry weather. In the case of the heavy oil incorporation with the scarified surface was not uniform which resulted in numerous breaks. Also where the oil had been applied as a dust preventive the skin film affords little or no protection to the clay surface.

During recent years more suitable and efficient road-maintenance equipment such as graders, scarifiers, and oil-distributing trucks have been employed and these, in combination with improved methods, have very materially reduced the upkeep on our roads. The operation of road upkeep, however, is a constant one and the grader units

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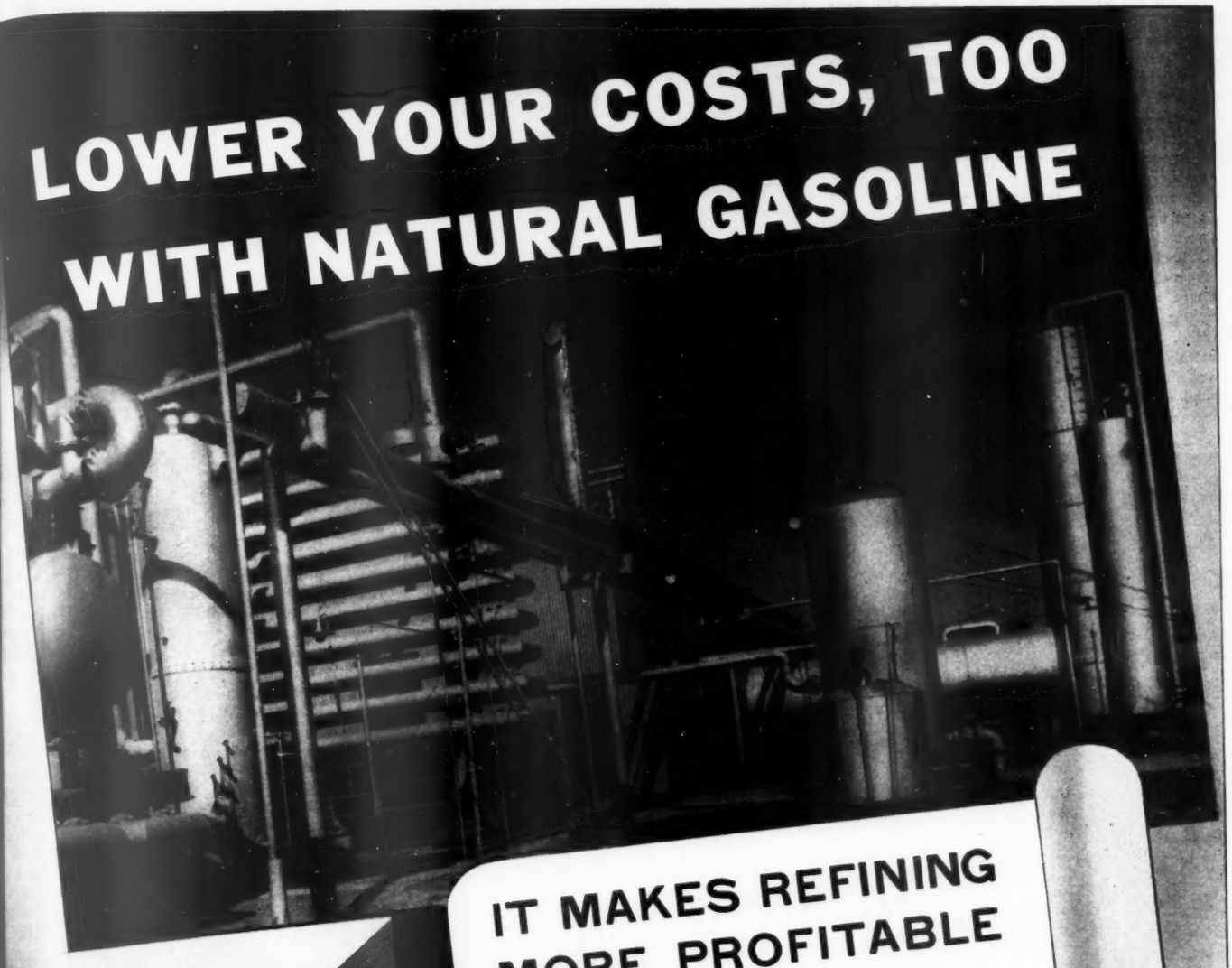

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Manufacturers, Exporters and Marketers of Natural Gasoline

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maintain an average of about 1 km. per day. For work on old roads, which have become rutted, caterpillar automatically controlled graders are used while on new soft roads a caterpillar terracer, which is a light hand-controlled unit, is used. A road which has become rough and rutted is first scarified by the grader to a depth of about 1½ in. and the loose material bladed into a central windrow. It is then sprayed liberally with a heavy oil or emulsion by means of pump operated from a power takeoff on a tank truck and bladed again to insure a good mix. This mixture is spread over the surface as uniformly as possible and packed down by traffic forming an oil-clay mixture of approximately 1½ in. in thickness. Where an occasional excess of oil is applied, leaving the resultant mixture soft and easily rutted, the surface is graded again and the oil entirely omitted. The stabilizing effect on the road surface by the application of oil has proved to be of great importance in maintaining traffic over freshly built roads in spite of heavy rainfall.

Ripper and angledozer on De Mares concession, Colombia

During the rainy season the oil trucks every afternoon spray the road built during the day even before grading. In this way the penetration of the soil by a heavy rain is prevented to a great extent.

The rapid growth of weeds and bush requires continuous cutting and clearing. Gangs of men with the long, heavy machetes are kept constantly busy fighting back the encroachment of tropical vegetation although in some localities oil has been used to retard the growth. In other areas where the soil is more fertile the roadside planting of grass has served a triple purpose in preventing erosion, lessening the danger of slides, and in holding back the ever-pressing jungle.

In the space of 20 years over 330 miles of oil-field roads have been built on the De Mares concession, or more than the entire distance from this point in the interior to the northern coast of South America. Also many bridges, 19 of which are of steel construction having a span of from 20 to 200 ft., have been installed at the rivers and largest creeks. Besides these, scores of timber bridges made of selected hard woods and covered with 4-in. plank flooring of mahogany and cedar have been built with spans ranging from 20 to 48 ft. While no claim is made that these roads are the equivalent of modern highways built for high-speed traffic, they do serve well the purpose for which they were intended, i.e., efficient and economical oil-field transportation.

•

Trinidad Supplying Crude to Canadian Refineries

Trinidad is now supplying a large part of the crude-oil requirements of McColl-Frontenac Oil Co. which has refineries at Montreal and Toronto, Canada.

Production in Trinidad is moving chiefly from properties of Antilles Petroleum Co. (Trinidad), Ltd., a wholly owned subsidiary of McColl-Frontenac.

Most of Antilles production in Trinidad comes from leases obtained from Trinidad Lake Asphalt Operating Co., Ltd., and Trinidad Lake Petroleum Co., Ltd., and consists mainly of heavy crude. The properties operated by Antilles under long-term leases is mostly in the Brighton-Vessigny area. The company is developing lighter production in the Point Ligoure district.

U.S.S.R. Orders Drilling Units

An order for 40 rotary drilling units placed in the United States by oil trusts of the U.S.S.R. was completed this month.

The units were all 23-in. types and were loaded at Galveston for movement by freighters.

MERCO Centrifugal SEPARATORS
INSURE GREATEST EFFICIENCY
IN CONDITIONING ROTARY MUD

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*MERCO Type A-24
DESANDER

* and MERCO Type A-24
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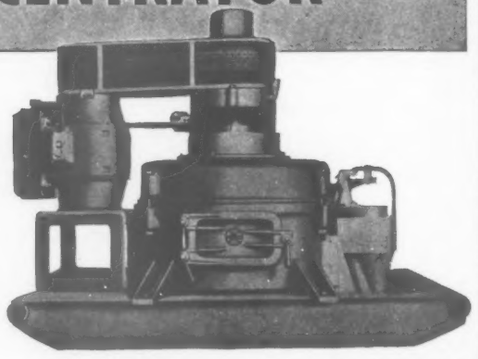

THE MERCO Type A-24 DESANDER

No other known method can possibly accomplish the complete and efficient separation of sand and cuttings from rotary mud as that obtained with the Merco Type A-24 Centrifugal Desander. Whereas other desanding methods leave most of the finer abrasive sand in the treated mud—the Merco leaves less than 1% plus 100 mesh sand and less than 3% plus 200 mesh sand at a capacity of 350 G.P.M. This is accomplished by a settling force of 110 gravity effects. Wear on equipment, mud loss, plus the hazard of stuck pipe and casing are considerably reduced. Large and important savings result.

THE MERCO Type A-24 CONCENTRATOR

For *recovering weighted mud; maintaining mud weight; controlling mud viscosity;* and *conserving* costly weighting material, the Merco Type A-24 Concentrator has no equal from the standpoint of economy, savings and efficiency. In actual operation, the Merco will achieve as high as 90% recovery of weighting material concentrated at 120-130 lbs./cu. ft. Pause and consider how much this would save you.

The Merco Type A-24 Concentrator differs from the Merco Type A-24 Desander in construction and application.

TRUE ECONOMY
IN DEEP DRILLING
STARTS WITH
MERCO'S SAVINGS

MERCO CENTRIFUGAL CO.

WHEN YOU USE T-I-W

SLIPS

YOU DO NOT HAVE TO PURCHASE A COMPLETE NEW SLIP WHEN TEETH ARE WORN, because of the MONEY-SAVING T-I-W RELINER PRINCIPLE.

1. Liners can be resharpened many times.
2. Liners can be replaced when completely worn. Saves buying a complete new set of slips, when after long use and resharpening many times, the liners finally wear out.

3. Liners for different sizes of pipe can be used in the same slip, thus saving the operator from having to buy different complete slips for different sizes of pipe.

Patented T-I-W Regular Three-Piece Reliner Type Slip 13¼" Bearing Surface Against Pipe

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This valve has an advantage over drill stem float valves as circulation is not restricted in any way, there being no obstruction in the drill pipe should same become stuck and have to be cut from the inside. Only one on the market having a straight core and sealing on both upper and down stream sides of body, eliminating the possibility of sand working between plug and body, thereby causing same to freeze.

T-I-W SLIPS used on WORLD'S DEEPEST WELLS

T-I-W SLIPS

Not necessary to purchase complete slips when teeth are worn. Liners can be resharpened many times.

Showing the two halves of Two-Piece Slips, also liners for same. 13¼" bearing surface against pipe.

T-I-W TUBING SLIPS AND SPIDERS

With Special Releasing Features

Can be used at any place where necessary to run a string of tubing.

Designed with a small degree of taper, thus greatly increasing the holding capacity.

Distinguished for its perfect releasing features.

This releasing feature insures against biting and crushing the pipe.

The regular type is made in three segments, each of which is held in perfect alignment while engaged with tubing, thus insuring a uniform friction grip.

STRENGTH: Possesses a large margin of reserve strength to hold any length of pipe.

Assembly showing T-I-W SPECIAL TUBING SLIP AND SPIDER

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Alaska Devoid of Active Drilling Operations

By L. P. STOCKMAN

ABANDONMENT of exploration operations on the Salmon Creek structure bv Standard Oil Co. of California, Tide Water Associated Oil Co. and Union Oil Co., leaves Alaska without an active drilling operation for the first time since mid-July 1938. The Salmon Creek structure, on the eastern side of the Alaskan Peninsula across Shelikof Strait from Kodiak Island, was tested to 7,596 ft., the depth at which the jointly drilled wildcat test was abandoned.

Failure of the Salmon Creek test to yield more encouraging evidence has caused at least temporary abandonment of earlier plans to drill four other similar structures on the government leases covering 135,000 acres. Another deep failure for Alaska was abandoned several years ago by the Iniskin Drilling Co. on the west side of Cook Inlet, west of Seward and southwest of Anchorage.

Failures Hinder Exploration

Prospects for additional exploration in Alaska are obscured by failure to find production in the Salmon Creek structure. Conditions do not justify permanent arrangements for unloading equipment from boats and for its movement inland. Severe winter weather forces a virtual cessation of operations for 6 months of each year. Accumulative results form a barrier around the expensive exploration conditions.

There is some uncertainty whether drilling was halted in Lower Jurassic or Upper Triassic. Standard, Tide Water and Union originally projected the test to explore the contact between the two systems, which was expected at about 6,000 ft. Thickening of the lower beds forced drilling approximately 1,600 ft. below the original estimate to reach the projected goal.

The joint wildcat test was started in July 1938, but all work was suspended during the winter of 1938-39; however the crew worked when weather permitted in the following winter. Drilling was suspended at 7,596 ft. last March but abandonment orders were deferred until recently.

The Salmon Creek structure is about 4 miles inland from Jute Bay and covers approximately 20,000 acres on a well-defined anticline. The structure has a moderate elevation of about 2,000 ft.

In addition to the structure tested, the three companies held leases on the Pearl anticline, Hubbell dome and two other features in the general area.

Two wildcat tests were drilled in 1922 by Standard and Associated on the Pearl Creek structure, 25 miles northwest of the more recently abandoned operation.

Seepages Mapped

The occurrence of minute quantities of petroleum in sedimentary rocks of the Alaska Peninsula has been known for more than 60 years. Oil seepages are found in many places on the peninsula. Prominent seepages have been mapped in the Cold Bay region, around Aniakchak Bay and Chignik.

Seepages in the Cold Bay region are divided into two groups lying along lines of anticlinal folding. Prominent seepages were found along the Salmon Creek anticline in vicinity of the deep test abandoned this year. There are two prominent seepages on the Pearl Creek anticline on which Standard and Associated drilled wildcat tests in 1922 and 1923.

Data obtained from recent drilling operations on the Salmon Creek anticline indicate that Pearl Creek exploration was stopped approximately 1,000 ft. above the Jurassic-Triassic contact.

In addition to oil seepages several gas seeps have been reported at the base of a bluff on the edge of a narrow valley in the East Fork of the Kejulik River.

The Upper Triassic rocks that outcrop on Cape Kekurnoi at the northeast passage to Cold Bay are the oldest sedimentary rocks exposed on the Alaska Peninsula. The Lower Jurassic rocks cover a few square miles in a narrow strip crossing the cape that separates Cold Bay from Alinchak Bay to the northeast. This strip is the only known area of Lower Jurassic on the peninsula.

There appears to be strict conformity between the Lower Jurassic and Triassic rocks, but the lack of fossils makes it difficult to determine the exact contact. The lack of conclusive fossil evidence leaves some doubt as to the series in which the latest drilling operation was abandoned.

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a Record Maker
for
Drilling Economy

IT IS the ability to withstand protracted pressure surges and the unavoidable abuse in operation and handling that explains the steadily increasing use of MANHATTAN Rotary Hose.

It resists kinking and elongation because of the high-tensile multiple bead wire strength-member placed in the neutral axis.

The more drilling you have to do, or the deeper you have to drill, the more reason for using MANHATTAN Rotary Hose with Type "D" Built-In, Full-Flow, Pressure-Tight Couplings.

Three types of MANHATTAN Rotary Hose — Grenadier, Super-Dreadnaught, and Dreadnaught—for different depths and pressures are described in Bulletin 6876. Write for it.

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Flat Belting and V-Belts; Oil Loading Hose; Piston Liner Sleeves; Stuffing Box Rings; Steam, Water, Fire, Air Hose; Brake Lining for Draw Works; Slush Pump Intake Hose; Molded Rubber Products; G.O.P. Tank Car and Truck Hose.

MANHATTAN Centaur Brand Rubber Covered Fire Hose is designed to meet the requirements of refinery fire protection. Built to stand use and exposure—Oil-resistant rubber cover and mildew-proofed duck.

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Cracking Eastern Venezuelan Crude Oil

By G. B. ZIMMERMAN, DAVIS READ, JR., and GUSTAV EGLOFF

Universal Oil Products Co., Research Laboratory, Chicago

THERE are three oil-producing areas in Venezuela, the Bolivar coastal fields, the Maracaibo Lake fields, and eastern Venezuela fields. The Maracaibo Lake fields have yielded the greatest amount of petroleum amounting to about 73 per cent[2] of the total oil production in Venezuela. The petroleums produced to date have been predominantly asphaltic in nature. In the 18 producing fields of importance in Venezuela, the producing horizons have ranged from the Cretaceous to the Pliocene with drilling depths varying from 490 to 5,000 ft.

Lagunillas pool produces from three horizons, the Eocene, the Oligocene, and the Miocene. The Eocene horizon yields a light-gravity oil which is important from a gasoline production standpoint, and this horizon has been investigated in the other fields as well as Lagunillas. The newer horizons, such as the Oligocene and Miocene, yield a heavier gravity oil containing high percentages of asphalt.

The resources estimated for western Venezuela have been about 2,000,000,000 tons, or about 15,000,000,000 bbl. of crude oil.[1] The exploration of eastern Venezuela has not extended enough to allow an estimate at the present since extensive wildcatting is still in progress and exploration tests have not been entirely completed. The Quiriquire field has proved the most prolific, so far producing 76 per cent[2] of the oil from eastern Venezuela. There are five producing fields in Venezuela: Padernales, Quiriquire, Temblador, Oficina and Jusepin. The Jusepin field is the newest, having been opened in 1939; within the year about a half million barrels of crude were produced having an A.P.I. gravity of 33°.

An eastern Venezuelan crude oil from the Temblador field was subjected to analysis to determine its properties as to gasoline, kerosene, topped and reduced crude. The topped crude was thermally cracked to determine yields and properties of the motor fuel produced.

Temblador crude is a heavy asphaltic oil containing little low-boiling fraction. Detailed properties of a 22.3° A.P.I. gravity sample of this crude are shown in Table 1, and its refining characteristics are discussed in the following paragraphs.

Fractionation of the Temblador crude sample through a 12-in. laboratory Hempel column, produced 12.1 per cent gasoline and 17.7 per cent kerosene as outlined in Table 2.

The presence of aromatic hydrocarbons in these fractions is shown by the high octane number (65.5) of the gasoline although it has a low-vapor

TABLE 1—PROPERTIES OF TEMBLADOR CRUDE OIL AND REDUCED CRUDE

Sample—	Crude	Reduced crude
Gravity, ° A.P.I.	22.3	16.5
Sp gr. at 60° F. (15.6° C.)	.9200	.9561
Sulfur, per cent	0.90	1.16
B.s. and w., per cent	0.1	0.2
Cold test, °F.	<—35	15
°C.	<—37.2	—9.4
Flash, Pensky-Martens, °F.	....	235
°C.	....	113
Viscosities:		
Universal at 100° F. (37.8° C.), sec.	191	....
Universal at 210° F. (98.9° C.), sec.	....	110
Furol at 122° F. (50° C.), sec.	....	94
Salt as sodium chloride, lb./1,000 bbl.	5	12
Characterization factor	....	11.53

100 cc. A.S.T.M. distillation:	°F.	°C.	°F.	°C.
I.B.P.	210	99	510	266
5 per cent	333	167	557	292
10	401	205	583	306
20	493	256	635	335
30	558	292	669	354
40	622	328	691	366
50	670	354	708	376
60	697	369	719	382
70	707	375	735	391
80	718	381	753	401
90	724	384	760+	404+
End point	724	384	760+	404+
Per cent over	92.5		90.0	
Per cent coke by weight	7.4		9.8	
Per cent at 400° F. (204° C.)	10.0			
Per cent at 572° F. (300° C.)	32.0		8.0	

TABLE 2

Breakup No.—	1	2
Yields, volume per cent of crude:		
Gasoline	12.1	12.1
Kerosene	17.7	
Topped crude	....	87.7
Reduced crude	70.0	
Water	0.1	0.1
Recovery	99.9	99.9
Loss	0.1	0.1
Yields, weight per cent of crude:		
Gasoline	10.1	10.1
Kerosene	16.5	
Topped crude	....	89.6
Reduced crude	73.1	
Water	0.1	0.1
Recovery	99.8	99.8
Loss	0.2	0.2
Properties of distillates:	Gasoline	Kerosene
Gravity, °A.P.I.	52.2	33.8
Sp. gr. at 60° F. (15.6° C.)	.7703	.8560
Total sulfur, per cent	0.03	0.18
Mercaptan sulfur, per cent	Sweet*	....
Hydrogen sulfide, per cent	0.001	....
Octane No. C.F.R. motor	65.5	....
Vapor pressure, Reid, lb./sq. in.	4.7	....
Universal viscosity at 100° F., (37.8° C.), sec.	....	34.5
Kinematic viscosity at 100° F., cts.	....	2.55
Characterization factor	11.75	11.42

100 cc. A.S.T.M. distillation:	°F.	°C.	°F.	°C.
I.B.P.	116	47	410	210
5 per cent	170	77	434	223
10	195	91	441	227
20	227	108	451	233
30	249	121	459	237
40	268	131	467	242
50	286	141	475	246
60	304	151	484	251
70	320	160	496	258
80	340	171	510	266
90	364	184	530	277
End point	400	204	567	297
Per cent over	98.5		99.0	
Per cent bottoms	1.0		1.0	
Per cent loss	0.5		....	

*After removal of H_2S.

Properties of bottoms—	Topped crude	Reduced crude
Gravity, °A.P.I.	19.0	15.8
Sp. gr. at 60° F. (15.6° C.)	.9402	.9606
Sulfur, per cent	1.01	1.21
B.s. and w., per cent	0.1	0.2
Cold test, °F.	—10	10
°C.	—23	—12
Flash, Pensky-Martens, °F.	220	300
°C.	104	149
Universal viscosity at 210° F. (98.9° C.), sec.	63.2	131
Furol viscosity at 122° F. (50° C.), sec.	....	134
Characterization factor	11.60	11.53

100 cc. A.S.T.M. distillation:	°F.	°C.	°F.	°C.
I.B.P.	444	229	578	303
5 per cent	491	255	612	322
10	507	264	627	331
20	559	293	658	348
30	617	325	685	363
40	665	352	701	372
50	687	364	713	378
60	709	376	723	384
70	731	388	732	389
80	745	396	742	394
90	755	402	748	398
End point	755	402	748	398
Per cent over	92.0		90.0	
Per cent coke by weight	8.1		10.0	
Per cent at 572° F. (300° C.)	22.0		....	

TABLE 3

Cracking test No.—	1	2
Yields, volume per cent of charge:		
Gasoline	30.3	32.4
Residuum	65.5	63.0
Recovery	95.8	95.4
Liquid volume loss	4.2	4.6
Gas, cu. ft./bbl. of charge	298	302
Yields, weight per cent of charge:		
Gasoline	23.8	25.5
Residuum	69.0	67.2
Gas	7.2	7.3
Recovery	100.0	100.0
Gas, cu. meters/metric ton of charge	56	56
Yields, volume per cent of crude:		
Cracked gasoline	21.2	22.7
Cracked residuum	45.9	44.1
Recovery	67.1	66.8
Liquid volume loss	2.9	3.2
Gas, cu. ft./bbl. of crude	209	212
Yields, weight per cent of crude:		
Cracked gasoline	17.3	18.6
Cracked residuum	50.3	48.9
Gas	5.2	5.3
Recovery	72.8	72.8
Gas, cu. meters/metric ton of crude	41	41

Cracking Results—Dubbs Pilot Plant

Cracking test No.—	1	2
Analysis of products:		
Untreated gasoline:		
Gravity, °A.P.I.	57.0	56.6
Sp. gr. at 60° F. (15.6° C.)	.7507	.7523
Total sulfur, per cent	0.37	....
Mercaptan sulfur, per cent	0.11	....
Octane No., C.F.R. motor	74	74
Vapor pressure, Reid, lb./sq. in.	10.4	9.6

100 cc. A.S.T.M. distillation:	°F.	°C.	°F.	°C.
I.B.P.	91	33	95	35
5 per cent	123	51	120	49
10	141	61	140	60
20	172	78	174	79
30	204	96	206	97
40	234	112	236	113
50	260	127	262	128
60	281	138	285	141
70	304	151	306	152
80	328	164	329	165
90	361	183	359	182
End point	400	204	397	203
Per cent over	97.0		98.0	
Per cent bottoms	1.0		1.0	
Per cent loss	2.0		1.0	
Composition, liquid volume, per cent:				
Propylene	0.26		0.05	
Propane	0.53		0.22	
Isobutylene	1.38		1.42	
n-Butylene	2.30		2.40	
Butanes	3.93		3.97	
Pentanes to 115° F. (46° C.)	10.46		10.85	
Fraction boiling above 115° F.	81.14		81.09	
Total	100.00		100.00	
Fraction boiling above 115° F.:				
Gravity, °A.P.I.	50.5		49.9	
Sp. gr. at 60° F. (15.6° C.)	.7775		.7800	
Residuum:				
Gravity, °A.P.I.	9.3		7.4	
Sp. gr. at 60° F. (15.6° C.)	1.0049		1.0187	
B.s. and w., per cent	0.4		0.2	
Furol vis. at 122° F. (50° C.), sec.	224		446	
Cold test	+25	—4	+40	+4
Flash, Pensky-Martens	235	113	230	110
100 cc. distillation:				
I.B.P.	493	256	508	264
Per cent at 572° F. (300° C.)	8.0		6.0	

[1]Dewhurst, T., J. Inst. Petroleum Technologists 20, 281 (1934).

[2]Williams, D. B., Petroleum Development & Technology 136, Trans. 581 (1940).

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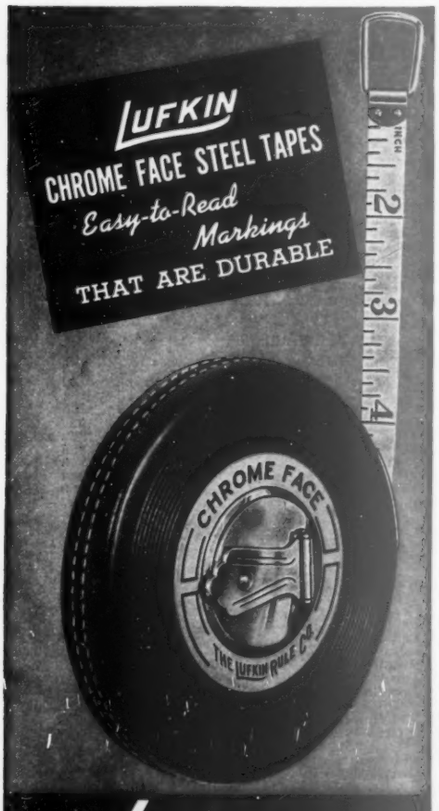

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pressure, high-distillation range, and high-specific gravity of both the gasoline and kerosene. This is also demonstrated by the low characterization factor. These characteristics, together with low-sulfur content, point toward the utilization of the straightrun gasoline as an aviation base stock. The presence of aromatic compounds in the kerosene, however, may necessitate further treatment before burning-test requirements can be met. The 19° A.P.I. gravity topped crude oil and 15.8° A.P.I. gravity reduced crude also show their aromatic nature in low-characterization factors.

For evaluation of cracking characteristics a reduced crude oil was used representing 70 per cent of the original crude after removal of gasoline and kerosene in commercial fractionating equipment. This 16.5-gravity stock was cracked in a Dubbs two-coil pilot plant having a normal capacity of 1.5 gal. of charging stock per hour to produce 400° F. end-point gasoline and a fuel-oil residue of approximately 9° A.P.I. gravity. As an alternate operation, similar gasoline and residue with a viscosity of approximately 450 seconds Furol at 122° F. was produced. Table 3 summarizes the results of these tests, showing 30.3 per cent gasoline having an octane number by the motor method of 74, while producing 65.5 per cent residue with an A.P.I. gravity of 9.3°. During the test the plant capacity was 2.93 gal. per hour. Under the conditions of the alternate operation in which the residue viscosity was increased from 224 seconds to 446 seconds, the gasoline yield was increased to 32.4 per cent.

TABLE 4

Cracking test No.—	1	2
Density (air = 1.00)	1.06	1.06
Composition, per cent by volume:		
Hydrogen sulfide	2.4	2.4
Oxygen	0.0	0.0
Nitrogen	0.0	....
Carbon monoxide	0.0	0.5
Hydrogen	5.1	....
Methane	31.3	....
Ethylene	3.4	3.7
Ethane	11.6	....
Propylene	11.4	....
Propane	23.0	....
Isobutylene	1.5	....
n-Butylene	2.2	....
Butanes	4.5	....
Pentanes and heavier hydrocarbons	3.6	....
Total	100.0	....
Unsaturates, total	18.5	19.4
Propylene and butylenes	15.1	15.7
Pentanes and heavier hydrocarbons (as liquid) gal. per 1,000 cu. ft.	1.32	....
Per cent by volume of charge	0.9	....

The gas produced as a byproduct of cracking, while ordinarily useful as fuel, contains propylene and butylene which are valuable raw material for the production of gasoline by catalytic polymerization. Complete analysis of the combined receiver and stabilizer gas and the dissolved gases in the gasoline were made by low-temperature fractionation and chemical absorption to determine their composition. Table 4 presents the results of analysis of the uncondensed gas and the analysis of gases dissolved in the gasoline are shown in Table 3.

The yield of pentanes and heavier hydrocarbons shown above as liquid is the amount which would be recovered from the receiver and stabilizer gas in an absorption system assuming complete recovery of these fractions.

Through the use of commercial recovery equipment and debutanization of the cracked gasoline, the available propylene and butylene may be collected and polymerized in a midget type catalytic unit to produce 2.4 per cent polymer gasoline of high value in blending to increase octane rating. Alternately, the isobutylene and a part of the normal butylene may be selectively polymerized to produce isooctane of approximately 95-octane number for aviation blending stock. The residual gas from the isooctane polymerization will produce 1.2 per cent polymer gasoline. In either case, the butanes which do not react in polymerization are returned to the cracked gasoline to adjust its vapor pressure.

The raw cracked gasoline as produced contains a relatively large amount of sulfur, 0.37 per cent, of which nearly one-third is mercaptan sulfur, resulting in a very sour gasoline. In addition, considerable gum is found in the copper dish test and the gasoline is strongly colored. To convert the raw gasoline to a marketable product, it was treated in the laboratory with clay and alternately with sulfuric acid in the following manner, as indicated in Table 5.

Summary

The results show that, when processed by simple fractionation, thermal cracking and catalytic polymerization, Temblador crude will produce an overall yield of approximately 35 per cent gasoline of good octane number together with 17.7 per cent kerosene and 45 per cent fuel-oil residue. Treatment of the cracked gasoline is required to produce a marketable product. Aviation gasoline is available from the straightrun gasoline and selective polymerization of the cracked gases to produce isooctane.

TABLE 5—LABORATORY TREATMENT OF CRACKED GASOLINE

Treatment—	None	Liquid phase ANCAP clay	Split caustic acid	
Acid, lb./bbl.	....	....	6	10
Kg./metric ton	....	....	23.8	38
Treating loss:				
Acid solution loss, per cent	....	....	3.0	5.1
Polymerization loss, per cent	....	....	1.7	2.4
Distillation loss, per cent	....	1.0	2.8	....
Total loss	....	....	7.5	9.9
Analyses of product:				
Gravity, °A.P.I.	56.7	56.8	56.6	56.7
Specific gravity at 60° F. (15.6° C.)	.7519	.7515	.7523	.7519

100 cc. A.S.T.M. distillation:	°F.	°C.	°F.	°C.	°F.	°C.	°F.	°C.
I.B.P.	100	38	103	39	103	39	106	41
10 per cent	145	63	154	68	155	68	158	70
50	261	127	265	129	259	126	259	126
90	367	186	356	180	355	179	347	175
End point	404	207	396	202	396	202	398	203

Vapor pressure, Reid, lb./sq. in.	10.5	7.1	6.7	5.5
Octane number	74	72.5	73	73
Color, Saybolt	Yellow	29	21	27
Color stability†	....	27	19	20
Doctor test	Pos.	Neg.	Neg.	Neg.
Mercaptan sulfur, per cent	0.11	*0.005	*0.02	*0.005
Sulfur, per cent	0.37	0.26	0.19	0.13
Peroxide No.	1.14	....	....	....
Gum Mg., cu. dish:				
Without inhibitor	382	12	21	15
With U.O.P. No. 1, 0.025 per cent	....	4	12	15
With U.O.P. No. 4, 0.005 per cent	....	4	5	10
Oxygen bomb ind., per min.:				
Without inhibitor	215	750	165	120
With U.O.P. No. 1, 0.025 per cent	....	1080	385	390
With U.O.P. No. 4, 0.005 per cent	....	1080	480	460

*Before final caustic wash and doctor sweetening. †Equivalent to 2 hours midday June sunlight.

Technical Training for Nationals Policy Venezuelan Companies

POLICIES which are being accorded increasing recognition by American industry have been virtually standard practice for oil companies operating in Venezuela almost since the beginning of the oil industry there. Just as oil companies operating in this country have recognized that the use of well-paid local labor and the health of the employes are important company considerations, so have those companies which are operating in the South American republic. Oil has led United States industry in employe-welfare work and the policies which have been found so successful here are being pursued even further in Venezuela.

Outstanding examples of this policy are the health and medical program and the national training plan conducted by the Standard Oil Co. of Venezuela and Lago Petroleum Corp. Similar programs are followed by the other companies, including the Shell group and Mene Grande Oil Co., so that the Venezuelan oil worker not only receives the best medical care possible but also is provided opportunity for improving his position with the company. As a result of this program of the oil companies, their employes enjoy the country's highest average standard of living. In providing these health and training facilities the oil companies are complying with the expressed wishes of President Contreras whose administration has devoted much effort to improving the economic and social position of the country.

Health First Problem

When oil was first discovered in Venezuela it became apparent that if these fields were to be operated economically the companies would have to solve the problems of health and sanitation. In those areas where adequate medical service did not exist, the companies provided sanitary and healthful working conditions as well as complete medical care for their employes.

As a part of its program, the Standard Oil Co. of Venezuela and Lago Petroleum Corp. constructed hospitals in the main camps and dispensaries in the outlying points. At the present time there are approximately 225 beds in their eight hospitals. In the western area, because of its greater industrialization, there are a number of private and government clinics but in eastern Venezuela all of these facilities are supplied by the companies. All these hospitals have the most modern equipment and the Caripito hospital is considered one of the most modern in the country. This hospital was opened in September 1939.

The Standard's medical staff, with the exception of a few special nurses, is composed entirely of Venezuelans. In all of the company operations there are approximately 25 doctors, some of whom are specialists in surgery and others in medicine while those in the smaller hospitals are general practitioners. The outstanding Venezuelan medical doctors associated with the company have been sent to the United States for special courses in their respective fields. In the opinion of the company's medical director the expense of the additional training received by these doctors has been completely justified. This contention is borne out by the decrease in the general overall sickness rate and hospitalization days.

Form Association

In Caracas where the companies maintain their main hearquarters, the company does not give free medical attention to employes and their families and does not maintain clinics, etc., due to the existing institutions. The company does, however, have a doctor on a retainer basis whose duties consist in making physical examinations of all new employes, periodical examinations of present employes and in general in advising the management on questions of health and sanitation.

Caracas employes have formed a medical asso-

(Continued on Page 279)

Top: Typical Venezuelan drilling crew, at Quiriquire field

Above: Two-family houses provided for laborers, Lago Petroleum Corp., Blanco, La Salina

Left: Lago Petroleum Corp. machine shop at La Salina, Venezuela

From the Days of

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Rumanian Oil Operations Geared to Axis Demand

ENCIRCLEMENT of the Rumanian oil industry by the tentacles of war narrowed the scope of influence of that country's petroleum to boundaries practically dictated by the Axis powers. More than 50 per cent of Rumania's petroleum exports went to Germany, Bohemia and Moravia during the final months of this year. The list of European countries receiving petroleum exported by Rumania has shrunk to 10 compared with an average of 17 in the earlier war months preceding entry of Italy. In the prewar months Rumania shipped her petroleum exports averaging around 2,500,000 bbl. monthly, to a list of 25 customer nations.

Countries of the Mediterranean, western Europe and Scandanavia have been blotted from the list of Rumanian oil purchasers largely because of the inability to circumvent the hazards of all tidewater exits. Reich domination of the Rumanian oil industry is just as complete and probably more effective as though accompanied by actual military conquest. The system of industrial infiltration employed to gain control of Rumanian oil and agriculture had the advantage of retaining the physical and personnel character of the private interests and avoided the probability of destruction concomitant with invasion.

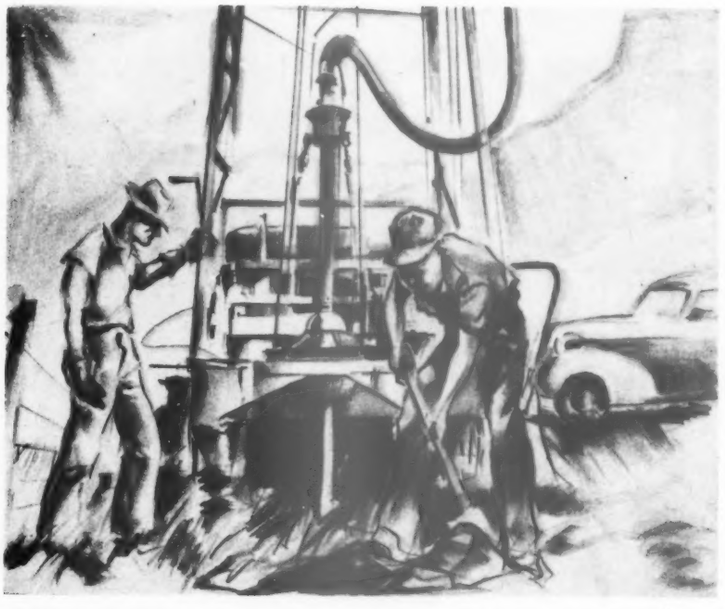
Details on production, exports and other phases of the Rumanian petroleum industry have been suppressed since occupation of the oil fields by German troops. Sufficient details were available from Rumania, however, during the first 8 or 9 months of the year to give a reasonably complete picture of the 1940 operations. Missing details include factual information on scope of the damage resulting from the severe earthquake in November. Meager reports indicate that damage was extensive to the producing properties and that surface equipment, including refineries, tanks, shipping terminals and pipe lines suffered to a relatively minor degree.

Swift intrusion of German forces at the time King Carol abdicated prevented fulfillment of any program of decommissioning the producing and refining facilities that were reported to have been evolved by British companies. The first move instigated by Germany after gaining political control of Rumania precipitated an executive order preventing oil companies from transferring titles in any way and from decommissioning any refining facilities. The procedure was for the obvious purpose of holding Rumanian oil facilities intact for the use of Germany in fulfilling her military requirements.

Transportation Equipment

Complete nationalization of transportation equipment was effected during the past few weeks in Rumania. The order involved government ownership of pipe lines from the fields centering around Ploesti and Campina running to the Danube River port of Giurgiu and the Black Sea terminal at Constanta. Germany followed this nationalization move by pledging material, financial and technical aid in the construction of two additional pipe lines, one to supplement the existing facilities to Giurgiu and the other to run almost directly west from the producing fields to a new Danube port at Moldova.

Rumanian crude-oil production this year skidded to the estimated total of 42,500,000 bbl., a reduction of 7 per cent compared to 45,640,100 bbl. in 1939. Peak production in Rumania was reached in 1936 when 65,062,295 bbl. were recovered. Consequently, this year's total output is almost 35 per cent below the peak 4 years ago.



SHOT HOLE DRILL — *From a lithograph by E. M. Schiwetz*

RUMANIAN CRUDE-OIL PRODUC

(Figures in ba

	July
DISTRICT OF PRAHOVA:	
Tintea	789,48
Lilliesti	38,61
Baicoi	69,21
Margineni	95,96
Moreni	360,33
Piscuri	233,74
Ceptura	347,39
Boldesti	422,39
Aricesti	13,12
Runcu	48,25
Chiciura-Bustenari-Bordeni	66,36
Campina	16,63
Pitigaia-Gura	7,33
Copaceni	13,58
Scaiosi	45
Total Prahova	2,522,95
DISTRICT OF DAMBOVITZA†	
Gura-Ocnitei	701,27
Bucsani	162,88
Ochiuri	169,82
Rasvad	153,47
Teis-Aninoasa	23,64
Viforata	9,74
Glodeni	86
Doicesti	
Total Dambovitza	1,221,70
DISTRICT OF BUZAU:	
Arbanasi	22,36
DISTRICT OF BACAU:	
All fields	26,85
TOTAL RUMANIA	3,793,87

*Converted from metric tons at the rate of 7.33

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Curtailment of drilling operations ordered by the private companies soon after the outbreak of war continued. Political unrest discouraged extension of investments in the development of properties, particularly those projected on extended amortization. The decline in crude-oil production is not outstanding in view of the reduction in drilling operations. Footage drilled in Rumania through the first 8 months of 1940 averaged 68,315 ft. monthly, a decline of approximately 5 per cent compared with the 1939 average of 71,250 ft. per month. A substantial part of the decline occurred during the third quarter between the date Italy entered the war and the time Germany assumed virtual control of Rumania's internal policies.

Private companies retain operating control of producing properties and refineries. Incomplete information indicates that companies are being compelled to increase operations although full effect of this policy will not appear in statistics until about the second quarter of 1941. Germany's occupation of Rumania came after petroleum operations had been slowed down materially below normal. Restrictions on exports covering the entire third quarter backed up products almost to the capacity of storage facilities. Therefore, Germany has the fundamental problem of freeing the arteries through which Rumanian oil flows before the policy of increasing production can be relayed back to the producing districts.

Most of the drilling in the first 8 months was concentrated in the district of Prahova, which embraces the important Tintea, Boldesti, Moreni, Ceptura and Piscuri fields.

The Tintea field has received the bulk of drilling activity over the past 2 years. The field produced about 21 per cent of all Rumanian oil in the first 8 months. Almost 25 per cent of the footage drilled was in Tintea where the south flank of the producing structure has received continuous development. Early in the discovery of south-flank production in 1937 operators succeeded in unitizing a majority of the portable producing acreage. The inducement of consolidated interests caused concentration of drilling, although the factor of density was absent. Completions in Rumania will total approximately 135 wells this year, including 15 failures. There were 176 completions in 1939, including 15 failures that were almost equally divided between field and wildcat operations. Most Tintea field production comes from the deep Meotic around 8,500 to 8,800 ft., depending on the structural position.

ON AND FOOTAGE DRILLED

ls' and feet)

July	Production August	Jan.-Aug.	Footage drilled July	August	Jan.-Aug.
789,48	840,000	6,352,060	19,085	22,995	145,685
38,61	41,795	313,070	7,965	9,965	42,070
69,31	66,280	447,570	195	5,815	25,515
95,96	102,830	692,445	9,155	7,545	57,675
360,33	362,435	2,977,240	720	8,475	24,665
233,74	236,360	1,729,110	4,445	1,345	33,610
347,39	351,865	2,947,860	4,875	4,770	42,230
422,39	424,635	3,242,335	680	10,775	35,875
13,12	12,545	103,895	.....	.....	.....
48,23	47,880	407,795	4,840	1,345	10,915
66,36	65,065	527,050	75	.....	1,070
16,63	16,450	135,920	.....	.....	.....
7,33	7,335	63,810	.....	.....	2,695
13,58	12,525	77,865	.....	.....	920
45	545	4,775	.....	.....	.....
2,522,93	2,588,545	20,022,800	52,035	73,030	422,925
701,27	682,930	5,547,445	4,900	13,100	67,665
162,88	165,275	1,290,345	.....	.....	630
169,83	167,175	1,266,580	6,330	7,500	21,275
153,47	156,470	1,168,455	.....	.....	10,010
23,64	23,755	198,365	840	3,725	11,180
9,74	9,740	77,595	.....	.....	.....
86	915	7,345	.....	.....	.....
	.....	.....	1,525	825	10,180
1,221,70	1,206,260	9,475,130	13,595	25,150	120,940
22,36	22,505	183,225	80	.....	685
26,57	26,695	210,795	100	325	1,975
3,793,57	3,844,005	29,891,950	65,810	98,505	546,525

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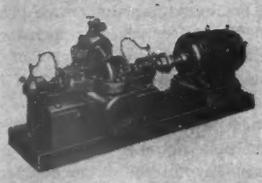
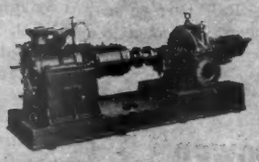
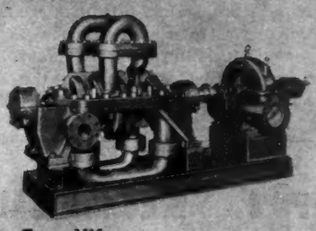


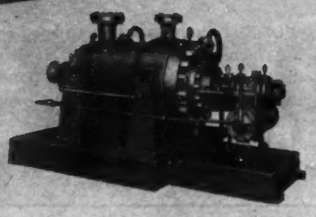
Type LT *centrifugal process pump, single-stage horizontally split—capacities to 2500 g.p.m., heads to 500 feet*



Type H *centrifugal refinery process pump, for high temperatures and high pressures, single-stage vertically split—capacities to 2000 g.p.m., heads to 700 feet*



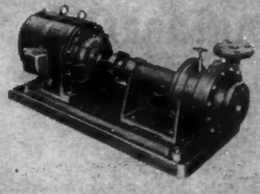
Type UX *centrifugal pipe line pump, multistage horizontally split—capacities to 55,000 bbl. per day, heads to 3500 feet*



Type WH *centrifugal hot oil charge pump, multistage vertically split — capacities to 68,000 bbl. per day, heads to 5000 feet*

Type DHL *centrifugal monobloc pump, for bulk loading and general transfer service, single-stage vertically split—capacities to 1000 g.p.m., heads to 250 feet*

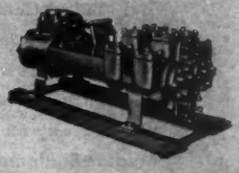
Type LX *centrifugal pump, for transfer, loading and general service, single-stage horizontally split—capacities to 3000 g.p.m., heads to 250 feet*



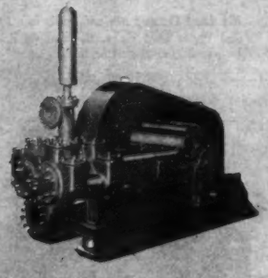
Type HL *centrifugal pump, for treating plants, acids and transfer service, single-stage vertically split—capacities to 1000 g.p.m., heads to 250 feet*

Type HB *centrifugal process pump, two-stage vertically split—capacities to 400 g.p.m., heads to 700 feet*

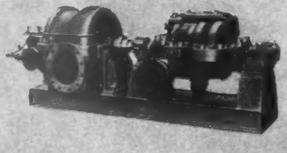
Type GR *rotary pumps, for gathering and general refinery service—capacities up to 140,000 bbl. per day, pressures to 300 lbs.*



Type PG *duplex steam pump for boiler feed service—pressures: 350 pounds, steam end; 1000 pounds, liquid end*

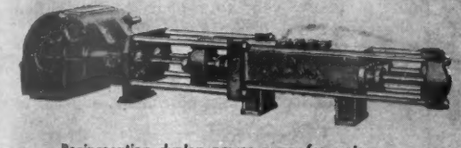


Type KMS *reciprocating duplex power pump, for gathering and pipe line, totally enclosed — capacities to 15,000 bbl. per day, pressures to 1500 pounds*

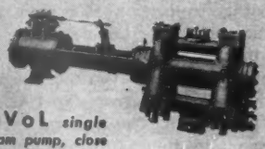


Type UV *centrifugal process pump, four-stage horizontally split—capacities to 1200 g.p.m., heads to 1500 feet*

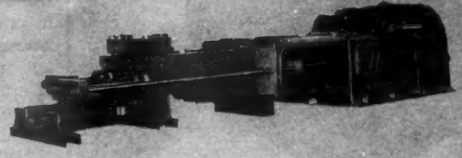
Reciprocating duplex hot charge power pump, double plunger—capacities to 34,000 bbl. per day, pressures to 1000 lbs.



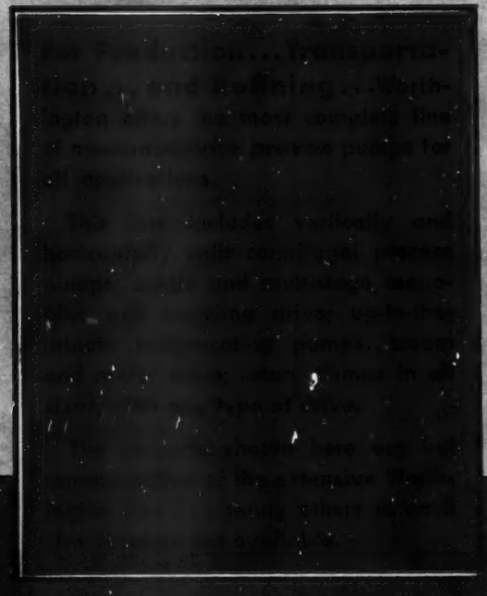
Reciprocating duplex power pump for water repressuring service—capacities to 6000 bbl. per day, pressures to 3000 pounds



HiVoL *single steam pump, close clearances for highly volatile liquids—capacities up to 215 g.p.m., pressures up to 400 pounds*



Reciprocating duplex pipe line power pump, double plunger—capacities to 15,000 bbl. per day, pressures to 1000 pounds



WORTHINGTON

Mexico's Production Shows Modest Gain

A MODEST increase in crude-oil production was achieved this year by Mexico owing to a modification of the trade restrictions with the United States which have existed to some degree since the expropriation in March 1938.

Mexican crude production for the year is estimated at 43,470,000 bbl., an increase of about 1 per cent compared to 42,897,500 bbl. in 1939. The estimated output for 1940 may prove too conservative when final data are available because of the last-quarter expansion in demand for residual fuels in the United States. Before Italy became an active combatant in the European war, Mexico was sending her approximately 15,000 bbl. of crude oil daily. Loss of the Italian market in June forced Mexico to depend almost entirely on the United States' market.

Modification of the United States trade barrier was brought about by settlement for the Consolidated Oil Corp.'s expropriated properties in Mexico. Terms involved shipment of about 5,000,000 bbl. of crude annually to this country, although the oil deal was technically independent.

Six Per Cent Gain

Actual production from Mexican fields for the first 9 months of 1940 totaled 32,068,546 bbl., according to reports from Petroleos Mexicanos, the government petroleum agency. Yield for the first three quarters of this year compares with 30,313,561 bbl. in the corresponding period in 1939, an indicated gain in 1940 of 6 per cent. The more modest increase estimated for the entire year is based partly on the fairly sharp expansion of Mexican production in the final quarter of 1939 incident to the now apparent preparation of Italy for participation in the European struggle.

There are several projects pending in Mexico's oil operations but none of more than local interest has progressed beyond the stage of speculation. One of the most important projects in the speculative stage is the 150-mile pipe line proposed from Puerto Mexico across the Isthmus of Tehuantepec, terminating at Salina Cruz on the Pacific Ocean. The plan lacks financial foundation and is accorded comparatively little chance of success unless it finds a niche in plans for defense of the Western Hemisphere.

Peak production for the first three quarters of the year was reached in July when output climbed to 3,969,411 bbl., a daily average of 128,045 bbl. The low mark for production was reached in January with 3,091,352 bbl. reported, a daily average of 99,721 bbl.

The Poza Rica field remains the nucleus from which the Mexican petroleum industry derives its strength. The field contained 29 producing wells on September 1. At the end of 9 months the Poza Rica field had produced 20,393,003 bbl. for 1940, a daily average of 74,427 bbl. and equal to nearly 64 per cent of the nation's total.

The table showing production by districts and months through the first 9 months indicates distinctly the conclusion of negotiations with Consolidated Oil Corp. Production from the South Tampico district (Naranjos) increased nearly threefold in June when movement of more oil from that area was made possible. Tampico crude did not figure directly in the increase in exports but probably went to replace higher shipments elsewhere.

Since the European market was completely shut off in June Mexico has shipped approximately 90 per cent of its monthly petroleum exports to the United States.

Crude-oil exports, which since expropriation make up an abundance of the offshore petroleum traffic, totaled 10,024,316 bbl. for the first 8 months of the year, an average of 1,253,040 bbl. Average monthly exports in 1939 were 1,601,665 bbl. In the accompanying table showing exports of crude by months and types of oil, the domination of Poza Rica is made even more significant. Through May Poza Rica crude exports averaged 767,675 bbl. per month. The average exportation of Poza Rica oil in June, July and August was

MEXICO'S CRUDE-OIL PRODUCTION

(Figures

Field—	January	February	March	April
N. Tampico	439,262	488,268	595,003	585,008
S. Tampico	223,584	179,724	168,446	151,124
Poza Rica	1,933,445	2,010,825	2,665,966	2,087,726
Isthmus area	495,061	430,223	467,643	502,678
Total	3,091,352	3,309,040	3,897,058	3,326,536

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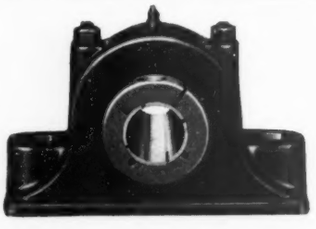

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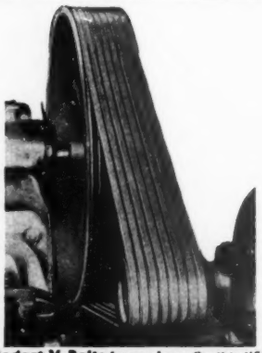

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MEDART

1,226,318 bbl. per month, an increase in average of 458,643 bbl., or 14,795 bbl. daily.

Mexico had 881 producing oil wells on September 1, an increase of 95 over the total reported at the same time in 1939.

There are four main pipe-line systems serving the Mexican producing fields. The aggregate of all systems is 724 miles and in 1940 they handled a combined average of 112,865 bbl. daily. The approximate daily runs of pipe lines by types of crude and length of the lines in miles are shown below:

Type of crude—	Daily runs	Length of line
Panuco	13,572	206
Naranjos	10.592	103
Poza Rica	73,247	327
Isthmus fields	15,454	88
Total	112,865	724

There are seven refineries in Mexico with a combined crude-oil capacity of 99,800 bbl. daily and cracking facilities for handling 18,830 bbl. daily. Since expropriation the export demand from Mexico has centered largely on crude oil. In the early stages of expropriation Germany was a large customer for Mexican oil. In 1939 Germany received an average of 4,055 bbl. of petroleum daily from Mexico. An average of 18,485 bbl. daily in 1939 went to Lands End, England, but from there most of it went to Germany, meaning that the Reich received more than 20,000 bbl. daily prior to the war. The actual shipments to Italy in 1939 are reported at 3,252,000 bbl., a daily average of 8,910 bbl., according to the Bureau of Mines.

The striking change that developed after expropriation in the nature of Mexican petroleum exports was evidenced by final 1939 figures. Total petroleum exports in 1939 of 19,220,000 bbl. consisted of 12,399,000 bbl. of crude, approximately 65 per cent of the total. In contrast, the 1938 exports of 14,681,000 bbl. consisted of 32 per cent crude and 68 per cent refined products.

The trend to exportation of increasing quantities of crude with a corresponding decline in shipments of refined products gives indication that Mexico's refineries are of diminished importance so far as world trade is concerned.

Petroleos Mexicanos was given exclusive jurisdiction over the nationalized petroleum operations by an executive decree issued in August. Efrain Buenrostro, minister of national economy under ex-President Cardenas, has been appointed general manager of "Pemex," succeeding Vicente Cortes Herrera.

The drilling program for 1941 provides for four wells in the North Tampico district, six in the Poza Rica field and five in the Isthmus fields. The exploration program is subject to revision in light of developments in the export demand for crude and refined products.

MONTHLY EXPORTATION OF CRUDE OIL, 1940

(Figures in barrels)

Month—	Crude— Poza Rica	Naranjos	Panuco	El Plan
Jan.	746,730	.....	208,240	72,744
Feb.	505,332	.....	189,134	.....
March	924,089	.....	289,041	193,326
April	800,796	.....	183,357	.....
May	861,428	138,924	298,898	.....
June	1,182,919	.....	162,971	.....
July	1,240,240	102,357	324,457	.....
Aug.	1,255,795	.....	347,538	.....
Total	7,513,329	241,281	2,003,636	266,070

Total all crude exports, 9 months 1940, 10,024,316 bbl.

BY DISTRICTS AND MONTHS, 1940

n barrels)

May	June	July	August	September
536,084	464,756	428,940	453,075	533,430
198,129	565,490	658,953	456,962	349,466
1,926,268	2,306,342	2,410,322	2,531,285	2,520,824
474,247	472,379	471,196	457,371	429,041
3,134,728	3,808,967	3,969,411	3,898,693	3,832,761

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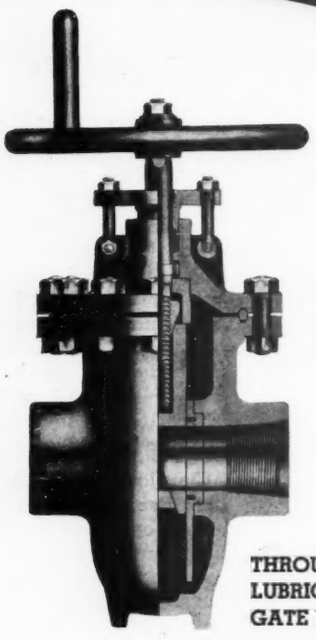
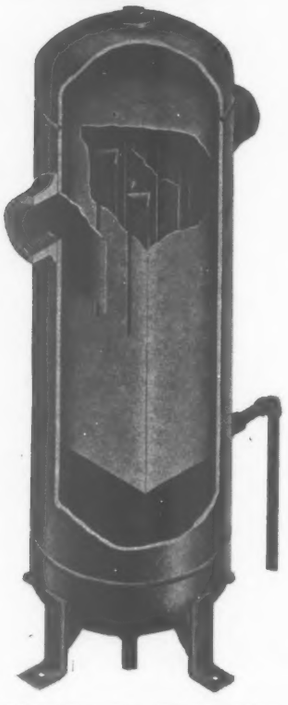


THROUGH-CONDUIT
LUBRICATED
GATE VALVE



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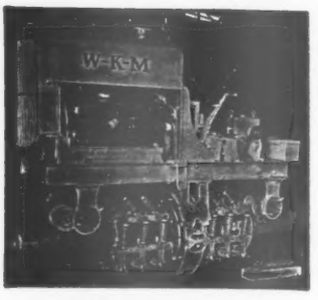
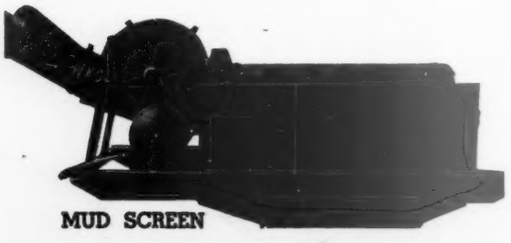
AIR, GAS OR STEAM SCRUBBER



PIPE CLEANING MACHINE

ROUND KELLY DRIVE

ROTARY SLIP



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Companies, Government Give Venezuelans Full Oil Display

Maquette, showing tanker and storage terminal at Puerto la Cruz, near Guanta, where Oficina, San Joaquin, Santa Ana and El Roble crude is exported

ONE of the most remarkable industrial expositions ever arranged for the education of the public drew more than 30,000 persons, an average of almost 1,000 a day, to the pavilion of the Hippodrome in Caracas, capital of Venezuela, during the first 5 weeks it was open. The exposition illustrates the operation and extent of Venezuela's important oil industry, showing producing, refining, and transportation operations in miniature. The large attendance, equivalent to 20 per cent of the population of Caracas, is indicative of the interest of the Venezuelan public in its oil industry.

The exposition was opened September 22 in the presence of Gen. Eleazar Lopez Contreras, president of the republic, and other government officials, including Dr. Manuel R. Egana, minister of fomento, as well as representatives of the oil companies operating in Venezuela. It is sponsored by the Ministry of Fomento and the three principal oil-producing companies, Standard Oil Co. of Venezuela—Lago Petroleum Corp. group, the Shell group, and Mene Grande Oil Co.

Mural Shows All Operations

The principal exhibit is a huge mural map of Venezuela made in perspective of a bird's-eye view of the country as it would appear looking due north from the Gran Sabana at a height of several miles. This map, 25 m. wide and 5 m high, forms the background of the main exhibit. On it are shown not only all the existing oil fields but also many points of national historical interest.

On a raised dais in front of the map there is an exact model of a modern refinery with a faithfully reproduced fractionating tower made of glass so that the products can be seen separating into various cuts. Thus the whole refining process can be seen functioning before one's eyes.

At each corner of the dais are 6-ft. steel oil derricks, reproductions of actual derricks to the most minute detail. One well is in the process of drilling. The drill pipe is carried down into the hole and a section of the dais is cut away so that the bottom of the hole can be shown and a miniature bit can be seen rotating in the subsoil. In other corners a pumping well is shown in operation as well as a flowing well and a workover well.

"Maquettes" Detail Fields

The central exhibit is flanked by large "maquettes" or tables about 25 ft. long. The various oil properties have been faithfully reproduced on these tables, showing refineries, drilling sites, workmen's houses, hospitals, schools, docks, and even miniatures of tank steamers operating on the lakes and rivers. This has been accomplished by the skillful use of plastic and everything is reproduced in its natural color. With the miniature rigs standing out in the lake and in the jungle, with roads shown exactly as they are in reality, the whole exhibit, when floodlighted, is surprisingly real in appearance.

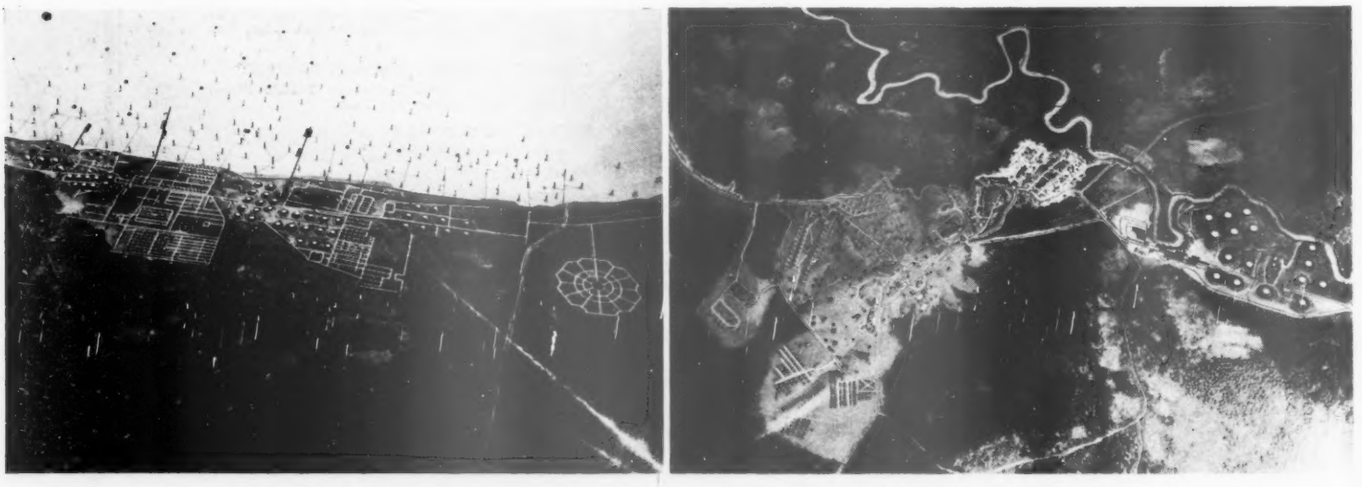
The maquette on the left of the central exhibit shows all the Lake Maracaibo operations of the Lago, Mene Grande, and Shell companies and that on the right shows the Caripito and Quiriquire operations of the Standard Oil Co. of Venezuela. This makes it possible for the visitor to study operations as they are carried on both in the lake region and in the jungles.

Airplane-View Impression

Walkways about 3 ft. high have been installed in front of the maquette so that visitors may look down on the exhibit. The perspective they obtain is comparable to an airplane view of the fields. The remarkable realism that has been attained in these models is apparent from the accompanying photographs, some of which were taken from the walkways.

At regular intervals one of the companies' young Venezuelan petroleum engineers gives a descrip-

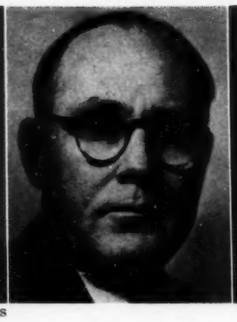
(Continued on Page 279)



Left: Venezuelan petroleum exposition, showing maquette of Lagunillas field. Seen at the right of picture is a model of the new Ciudad Ojeda. Right: Maquette of Caripito terminal in eastern Venezuela

Curtis Wilshire

Gittings



Blank & Stoller

Gray

NOMADS HAVE ACTIVE YEAR

THE Nomads, with four chapters located in Los Angeles, Houston, Tulsa and New York will close the year with more than 200 active members. The organization is composed of representatives of oil-supply, manufacturing and service organizations connected with the petroleum industry who have traveled outside the United States in the interest of their companies.

During the past year the New York chapter was organized and plans for a national organization were perfected. The four chapters as a group were in charge of the entertainment of foreign delegates attending the International Petroleum Exposition in Tulsa last May.

Right—Monthly dinner of Tulsa chapter, December 16, M. P. Tixier, Schlumberger Well Servicing Corp., was the principal speaker. Officers: Fred E. Cooper, Fred E. Cooper Co., president; W. G. Green, Engineering Laboratories, Inc., vice president and H. M. Cosgrove, secretary and treasurer.

Above— Houston chapter, Rex. G. Hamaker, Reed Roller Bit Co., president; Frank Champion, Byron Jackson Co., vice president; J. H. McEvoy, secretary and treasurer; R. L. Dudley, Gulf Publishing Co., assistant secretary-treasurer; Kenneth Craver, Thornhill-Craver Co., sergeant-at-arms; Gordon Richmond, Hughes Tool Co., assistant sergeant-at-arms.

Below—Monthly dinner, Los Angeles chapter. Ted Sutter, Baker Oil Tools, Inc., president; S. R. Bowen, S. R. Bowen Co., vice president; W. F. Bettis, M. O. Johnston Oil Field Service Corp., secretary and treasurer.

Bottom—First annual dinner, New York chapter. John H. Baird, president; W. J. Campbell, vice president; E. H. Trammell, secretary and treasurer.

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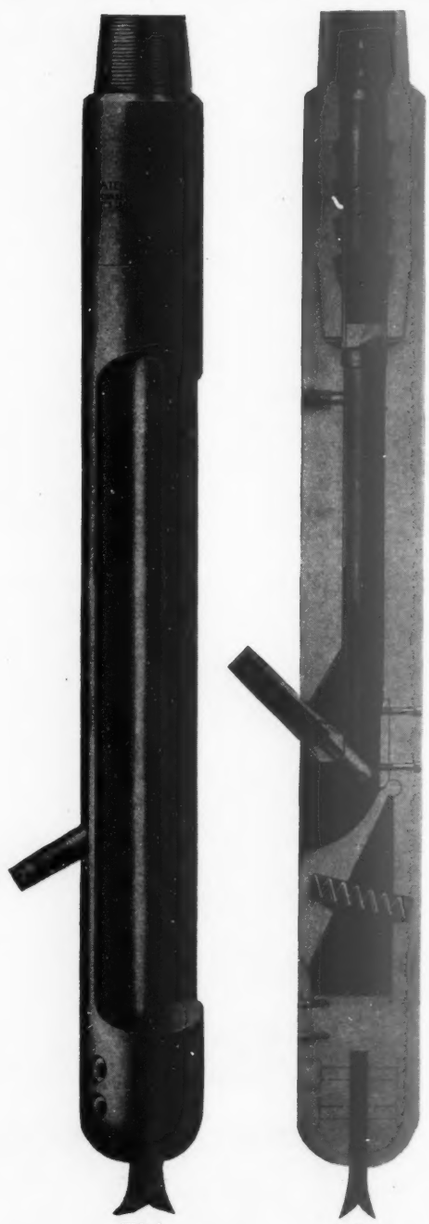

FIG. 1 FIG. 2

Figure 1 shows core tube as it enters side wall upon downward movement of drill stem. Figure 2 shows resting position after sample is taken, ready to be recovered after upward drill stem movement returns core tube to normal deflected position. Patents applied for. Licensed under U. S. Patents Nos. 1603642—1815661—2176375.

THE HOMCO Side Wall Sampler permits you to drill to a predetermined depth without the costly interruptions required by conventional coring methods. Utilizing this tool, wells may now be drilled to projected depth, electrically logged, and side wall cores obtained of all possible producing zones . . . quickly, safely, accurately and economically.

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The drill collar, or main body of the tool, is designed to permit rotation and circulation while going in or coming out of the hole, thereby protecting the walls of the hole and eliminating any hazards controllable by maintenance of the proper drilling fluids in the well, and also providing for drilling out bridges or loose formation. A special circulating head with a safety wire line stuffing box is provided and may be used for rotating and circulating while the wire line is in the hole.

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Customer	Sample depth	Number samples
Stanolind Oil & Gas Co.	5000'- 6000'	21
Humble Oil & Refining Co.	4000'- 5000'	12
Humble Oil & Refining Co.	4000'- 5000'	11
The Texas Company	5000'- 6000'	8
Berkshire Oil Co.	5000'- 6000' ★	5
Glenn H. McCarthy, Inc.	10000'-11000'	5
Stanolind Oil & Gas Co.	4000'- 5000'	8
Humble Oil & Refining Co.	6000'- 7000'	6
Amerada Petroleum Company	8000'- 9000'	19
Humble Oil & Refining Co.	8000'- 9000'	9
Humble Oil & Refining Co.	4000'- 5000'	8
Humble Oil & Refining Co.	7000'- 8000'	5
Humble Oil & Refining Co.	8000'- 9000'	5
Amerada Petroleum Co.	8000'- 9000'	5
Berkshire Oil Company	5000'- 6000'	7
Superior Oil Company	5000'- 6000' ★	7
The California Company	12000'-13000'	7
Humble Oil & Refining Co.	8000'- 9000'	23
Stanolind Oil & Gas Co.	4000'- 5000'	5
Humble Oil & Refining Co.	6000'- 7000'	13
Stanolind Oil & Gas Co.	5000'- 6000'	5
The Texas Company	6000'- 7000'	8
Superior Oil Company	7000'- 8000'	8
Humble Oil & Refining Co.	7000'- 8000'	10
Humble Oil & Refining Co.	7000'- 8000' ★	7
Tidewater Associated Oil Co.	9000'-10000' ★	5
Stanolind Oil & Gas Co.	9000'-10000' ★	7
Tyro Royalty Co.	2000'- 3000'	12
The Texas Company	5000'- 6000'	10
Rowan Drilling Company	4000'- 5000'	35
Sun Oil Company	7000'- 8000'	8
Stanolind Oil & Gas Co.	8000'- 9000' ★	28
Tidewater Associated Oil Co.	10000'-11000'	15
The Texas Company	4000'- 5000' ★	5
Tidewater Associated Oil Co.	9000'-10000'	22
Stanolind Oil & Gas Co.	7000'- 8000'	13
Amerada Petroleum Co.	8000'- 9000'	18
Humble Oil & Refining Co.	8000'- 9000' ★	13
Humble Oil & Refining Co.	10000'-11000'	7
Amerada Petroleum Co.	8000'- 9000'	21
Woodlan Oil Company	8000'- 9000'	7
Amerada Petroleum Co.	6000'- 7000'	5
Humble Oil & Refining Co.	7000'- 8000'	13
Humble Oil & Refining Co.	6000'- 7000'	8
Rowan Drilling Company	6000'- 7000' ★	5
The Texas Company	9000'-10000'	5
E. J. Gracey	6000'- 7000' ★	5
The Texas Company	10000'-11000'	18
Barnsdall Oil Company	7000'- 8000' ★	7
Humble Oil & Refining Co.	10000'-11000' ★	14
Humble Oil & Refining Co.	9000'-10000'	12
Rowan Drilling Co.	6000'- 7000'	11
Stanolind Oil & Gas Co.	6000'- 7000'	6
Sun Oil Company	6000'- 7000'	11
The Texas Company	7000'- 8000'	5
Humble Oil & Refining Co.	5000'- 6000'	8
Humble Oil & Refining Co.	9000'- 9000'	6
Amerada Petroleum Company	7000'- 8000' ★	17
Tidewater Associated Oil Co.	11000'-12000'	9
Transwestern Oil Company	6000'- 7000'	11
Falcon-Seaboard Drilling Co.	5000'- 6000'	5
Humble Oil & Refining Co.	4000'- 5000' ★	6
Shell Oil Company, Inc.	10000'-11000' ★	5
The Texas Company	10000'-11000'	9
Humble Oil & Refining Co.	8000'- 9000'	6
Stanolind Oil & Gas Co.	7000'- 8000'	5
Continental Oil Company	2000'- 3000'	5
Humble Oil & Refining Co.	6000'- 7000'	19
Tidewater Associated Oil Co.	7000'- 8000' ★	20
——— Petroleum Co.	10000'-11000'	20
Sun Oil Co.	8000'- 9000'	5
The Texas Company	6000'- 6000'	12
Sun Oil Company	7000'- 8000'	8
Continental Oil Company	8000'- 7000'	5
——— Petroleum Co.	8000'- 9000'	5
The Texas Company	6000'- 7000' ★	12
The Texas Company	10000'-11000'	8
The Texas Company	7000'- 8000' ★	5
The Texas Company	9000'-10000'	5
Renwar Oil Corp. & John Mayo	6000'- 7000'	27
Humble Oil & Refining Co.	5000'- 6000'	5
The Texas Company	5000'- 6000'	7
The Texas Company	8000'- 9000'	17
Humble Oil & Refining Co.	8000'- 9000'	5
Sun Oil Company	5000'- 6000'	8
Standard Oil Company of Texas	5000'- 6000' ★	5
The Texas Company	10000'-11000'	6
Davis & Company, Inc.	3000'- 4000'	5
Stanolind Oil & Gas Co.	5000'- 6000'	5
Amerada Petroleum Co.	8000'- 9000'	15
Humble Oil & Refining Co.	5000'- 6000'	5
Humble Oil & Refining Co.	8000'- 9000'	8
The Texas Company	5000'- 6000' ★	5
The Texas Company	9000'-10000'	5
The Texas Company	8000'- 9000'	5
Humble Oil & Refining Co.	6000'- 7000' ★	14
The Texas Company	10000'-11000'	7
Humble Oil & Refining Co.	6000'- 7000'	6
Lon H. Cron	5000'- 6000'	5
Humble Oil & Refining Co.	8000'- 9000'	8
The Texas Company	3000'- 4000'	14
Humble Oil & Refining Co.	8000'- 9000'	18
Mills Bennett Production Co.	7000'- 8000'	5
The Texas Company	4000'- 5000' ★	8
William Helis	9000'-10000' ★	6
The Texas Company	9000'-10000'	8
The Texas Company	7000'- 8000' ★	25
Stanolind Oil & Gas Co.	9000'-10000' ★	16
William Helis	9000'-10000'	5
Humble Oil & Refining Co.	7000'- 8000'	9
Humble Oil & Refining Co.	5000'- 6000' ★	5
Humble Oil & Refining Co.	10000'-11000'	12
Humble Oil & Refining Co.	4000'- 5000'	8
Sun Oil Company	6000'- 7000' ★	5
The Texas Company	10000'-11000'	10
The Texas Company	7000'- 8000' ★	14
Amerada Petroleum Co.	9000'-10000'	28
The Superior Oil Company	6000'- 7000'	5
Houston Oil Company of Texas	6000'- 7000'	5
Humble Oil & Refining Co.	7000'- 8000' ★	21
Humble Oil & Refining Co.	10000'-11000' ★	9
Humble Oil & Refining Co.	10000'-11000'	5
Nickles Drilling Company	3000'- 4000'	7
Standard Oil Company of Texas	7000'- 8000'	7
Wellington Oil & Gas Co.	6000'- 7000'	5
The Texas Company	4000'- 5000'	5
The Texas Company	5000'- 6000' ★	12
Humble Oil & Refining Co.	10000'-11000'	6
Abbott & Traxler	7000'- 8000'	6
The Texas Company	8000'- 9000'	5
Humble Oil & Refining Co.	5000'- 6000'	6
Roxie Oil Company	2000'- 3000'	5
Humble Oil & Refining Co.	8000'- 9000'	6
Amerada Petroleum Co.	8000'- 9000'	23
Humble Oil & Refining Co.	6000'- 7000'	5
Humble Oil & Refining Co.	7000'- 8000' ★	6
Glenn H. McCarthy, Inc.	11000'-12000'	11
The Texas Company	5000'- 6000' ★	6
The Texas Company	10000'-11000' ★	17
The California Company	9000'-10000'	8
H. J. Porter	7000'- 8000' ★	7
The Texas Company	9000'-10000'	5
Humble Oil & Refining Co.	8000'- 9000' ★	8
Tidewater Associated Oil Co.	10000'-11000'	11
Burton & McClean	3000'- 4000'	5
Humble Oil & Refining Co.	8000'- 9000'	6
Humble Oil & Refining Co.	6000'- 7000'	22
Humble Oil & Refining Co.	8000'- 9000'	5
The Texas Company	6000'- 7000'	8
Cockburn Oil Company	8000'- 9000'	8
John A. Deering	3000'- 4000'	9
Humble Oil & Refining Co.	2000'- 3000'	5
Rowan Drilling Company	2000'- 3000'	41
Standard Oil Company of Texas	8000'- 9000'	5
Sun Oil Company	5000'- 6000'	14
Tidewater Associated Oil Co.	7000'- 8000'	5
Carter Drilling Company	6000'- 7000'	11
Humble Oil & Refining Co.	5000'- 6000'	7
Amerada Petroleum Corp.	8000'- 9000'	23
Humble Oil & Refining Co.	7000'- 8000'	5
The Texas Company	5000'- 6000'	5
The Texas Company	8000'- 9000'	9
Windsor Oil Company	4000'- 5000'	5
The Texas Company	6000'- 7000' ★	7
Grady H. Vaughn	11000'-12000' ★	10
Humble Oil & Refining Co.	8000'- 9000'	20
Longhorn Drilling Company	5000'- 6000' ★	10
Standard Oil Company of Texas	9000'-10000'	22
Continental Oil Company	7000'- 8000' ★	5
Deep Rock Oil Company	10000'-11000'	14
Humble Oil & Refining Co.	8000'- 9000'	9
Tidewater Associated Oil Co.	8000'- 9000'	18
Heep Oil Company	7000'- 8000'	8
General Crude Oil Company	6000'- 7000' ★	8
Gulf Refining Company	12000'-13000'	7
Stanolind Oil & Gas Co.	8000'- 9000'	5
The Texas Company	6000'- 7000'	10
The Texas Company	6000'- 7000' ★	8
Humble Oil & Refining Co.	9000'-10000'	8
Humble Oil & Refining Co.	3000'- 4000' ★	5
Glenn H. McCarthy, Inc.	10000'-11000' ★	19
Sal Vieje Oil Company	9000'-10000'	5
Humble Oil & Refining Co.	1000'- 2000' ★	12
The Texas Company	10000'-11000'	7
Humble Oil & Refining Co.	5000'- 6000'	36
Humble Oil & Refining Co.	5000'- 6000'	5
Stanolind Oil & Gas Co.	8000'- 9000'	6
Stanolind Oil & Gas Co.	8000'- 9000'	10
Stanolind Oil & Gas Co.	7000'- 8000'	5
Sun Oil Company	6000'- 7000'	18
The Texas Company	8000'- 9000'	9
Humble Oil & Refining Co.	7000'- 8000'	10
Humble Oil & Refining Co.	3000'- 4000'	8
Humble Oil & Refining Co.	4000'- 5000' ★	6
Rowans & Nichols	9000'-10000'	5
Amerada Petroleum Corp.	7000'- 8000'	15
Sun Oil Company	6000'- 7000'	15
The Texas Company	6000'- 7000'	5
The Texas Company	4000'- 5000'	8
Humble Oil & Refining Co.	5000'- 6000'	5
Gulf Refining Company	5000'- 6000'	10
Amerada Petroleum Corp.	8000'- 9000'	16
O. W. Dyer	3000'- 4000'	5
Amerada Petroleum Corp.	8000'- 9000'	25
The Texas Company	4000'- 5000'	11
The Texas Company	5000'- 6000'	8
O. W. Dyer	2000'- 3000'	20
W. Stewart Boyle	5000'- 6000' ★	5
The Superior Oil Company	11000'-12000'	19
Longhorn Drilling Company	5000'- 6000'	5
The Texas Company	4000'- 5000' ★	9
The Superior Oil Company	11000'-12000'	5
The Richfield Oil Company	6000'- 7000'	11
The Texas Company	5000'- 6000'	5
Humble Oil & Refining Co.	6000'- 7000'	5
Humble Oil & Refining Co.	8000'- 9000'	13
The Texas Company	4000'- 5000'	5
Ralph E. Fair, Inc.	3000'- 4000'	5
Humble Oil & Refining Co.	5000'- 6000'	10
The Atlantic Refining Co.	7000'- 8000'	8
Humble Oil & Refining Co.	5000'- 6000' ★	17
The Texas Company	9000'-10000' ★	7
The Texas Company	9000'-10000'	5
O. W. Dyer	3000'- 4000'	14
Humble Oil & Refining Co.	8000'- 9000'	10
Humble Oil & Refining Co.	5000'- 6000'	11
Sun Oil Company	4000'- 5000' ★	7
Amerada Petroleum Corp.	9000'-10000'	37
The Texas Company	2000'- 3000'	5
Roxie Wright	5000'- 6000'	5
Humble Oil & Refining Co.	3000'- 4000'	8
McCarthy Drilling Company	4000'- 5000' ★	40
The Texas Company	10000'-11000'	5
Humble Oil & Refining Co.	6000'- 7000'	5
Sun Oil Company	5000'- 6000'	8
Humble Oil & Refining Co.	5000'- 6000'	13
W. R. Davis, Inc.	4000'- 5000'	5
R. Y. Lytle	6000'- 7000' ★	5
Humble Oil & Refining Co.	10000'-11000'	5
Humble Oil & Refining Co.	4000'- 5000'	5
P. R. Rutherford	3000'- 4000'	5
Gulf Refining Company	7000'- 8000'	5
Humble Oil & Refining Co.	5000'- 6000'	5

DIRECTORY OF EXPORT ORGANIZATIONS

Export Oil Well Supply Companies

Continental Emsco Co., Inc.

(Subsidiary of the Continental Supply Co.)

F. L. Convers, vice president.
30 Rockefeller Plaza, N. York, N. Y.
Representatives, London, England; Buenos Aires, Argentina; Maracaibo, Venezuela; San Fernando, Trinidad.

Distributors in all countries outside of U.S.A. for the following manufacturers:

- Climax Engineering Co.
- D. & B. Pump & Supply Co.
- Emsco Derrick & Equipment Co.
- Farrar & Trefts, Inc.
- Gardner-Denver Co.
- Goodall Semi-Metallic Hose & Manufacturing Co.
- A. Leschen & Sons Rope Co.
- E. M. Smith Co.
- Youngstown Sheet & Tube Co.

Frick-Reid Supply Co.

230 Park Ave., New York, N. Y., U.S.A.
Distributors in all countries outside of United States for the following manufacturers:

- Beaumont Iron Works
- Jeffery Manufacturing Co.
- Merla Tool Co.
- Donovan Boiler Works

Lucey Export Corp.

Oil well supplies

3505 Woolworth Bldg., New York, N. Y. Buenos Aires, Argentina; Houston, Tex.; London, England; Ploesti, Rumania; Trinidad, British West Indies.
Exporters rotary and cable-tool drilling equipment, steam drilling rigs, diesel mechanical, diesel electric, electric drilling equipment, slim-hole drilling equipment, casing, drill pipe, line pipe, tubing, wire rope, etc.

Exclusive export distributor:

- Beck Engineering Combustion Co.
- Buffalo Bolt Co.
- Kibele Manufacturing Co.
- Lucey Boiler & Manufacturing Corp.
- Lucey Products Corp.
- New Deal Specialty Co., Inc.
- Pittsburgh Steel Co.
- Rector Well Equipment Co., Inc.
- Spencer Trailer Co.
- Technical Oil Tool Corp., Ltd.
- Union Wire Rope Corp.
- The Wheland Co.

Export distributor:

- Allis-Chalmers Manufacturing Co.
- American Steel Derrick Co.
- American Iron & Machine Works Co
- Baash-Ross Tool Co.
- Byron Jackson Co.
- Cameron Iron Works, Inc.
- Chain Belt Co.
- Fluid Packed Pump Co.
- Hughes Tool Co.
- Maloney Tank Mfg. Co.
- Reed Roller Bit Co.
- South Chester Tube Co.

The National Supply Corp.

30 Rockefeller Plaza, New York, N. Y.
River Plate House, London; Maracaibo, Venezuela.
L. V. Boggs, vice president.
F. T. Ostrander, vice president.
E. M. Gretzler, manager export sales.
Representatives, Port of Spain, Trinidad; Buenos Aires, Argentina; Sydney, Australia; Rio de Janeiro, Brazil.

Exclusive export oil field representatives:

- Ideal-Ajax Steam Engines
- Roebling Wire Ropes
- Novo Pumps and Engines
- Skinner Clamps
- National Tanks & Separators
- Broderick Boilers
- Stoody Hard-Facing Metals
- Manhattan Rubber Products
- Billings & Spencer Tongs
- Superior Diesel & Gas Engines
- National-Ideal Drilling and Production Equipment
- Spang Chalfant Tubular Products
- Dayton Pipe Couplings

Oil Well Supply Co.

(Subsidiary of United States Steel Corporation)
Export division: 30 Rockefeller Plaza, New York, N. Y. Room 3023—R.C.A. Building. M. E. Nicklin, manager.
Manufacturers of complete oil well drilling equipment powered by steam or internal combustion engines; and complete surface and subsurface equipment for production requirements.

Suppliers:

- Tiger brand products of American Steel & Wire Co.
- Drill pipe, line pipe, casing and tubing manufactured by National Tube Co.

Exclusive distributors:

- Kerotest Manufacturing Co. products.

Export offices in:

- England—London.
- Argentina—Buenos Aires
- Cuba—Havana
- Iugoslavia—Belgrade
- Brazil—Rio de Janeiro
- Trinidad—San Fernando
- Union of South Africa—Johannesburg
- Venezuela—Maracaibo

Export Representatives

Acme Well Supply Co.

Edward L. Racek, president.
19 Rector St., New York, N. Y.

- Acme Fishing Tool Co.
- Ampco Metal, Inc.
- Armstrong Bros. Tool Co.
- The Brewster Co.
- Brown Oil Tool Co.
- Franks Machine Co.
- Mills Alloys, Inc.
- Northrup Equipment Co.
- Oil City Brass Works
- Howard Smith Co.

The Armco International Corp.

Middletown, Ohio.
Armco Argentina, S.A.
Corrientes 330, Buenos Aires, Argentina.
Branches in Rosario, Tucuman, La Plata, Cordoba.

- Lincoln Electric Co.
- Merco-Nordstrom Valve Co.
- Universal Insulation Co.
- Coffing Hoist Co.

Axelson Manufacturing Co., Inc.

A. A. Dill, manager, New York division.
50 Church St. (Room 1850) New York, N.Y.

- Jensen Bros. Manufacturing Co.

John H. Baird

420 Lexington Ave., New York, N. Y.

- American Iron & Machine Works Co.
- Byron Jackson Co.
- International Cementers, Inc.
- Lane Wells Co.
- Security Engineering Co.

I. Frank Brown

30 Rockefeller Plaza, New York, N. Y.

- A-1 Bit & Tool Co.
- Baash-Ross Tool Co.
- Fred I. Getty
- The Guiberson Corp.
- International Stellite Corp.
- Oxweld Acetylene Co.
- Texas Rubber & Specialty Corp.

Cardwell Manufacturing Co., Inc.

F. J. Olson, export manager.
570 Lexington Ave., New York, N. Y.

Chiksan Tool Co.

Herb E. Maland
50 Church St., New York, N. Y.

Crawford Engineering Co., Inc.

H. D. Crawford, president.
295 Madison Ave., New York, N. Y.

- V. D. Anderson Co.
- McCord Radiator (Lubricator Division)
- Meriam Co.

Guy E. Daniels

30 Rockefeller Plaza, New York, N. Y.

- Bariwate Co.
- Black, Sivalls & Bryson, Inc.
- Carson Machine & Supply Co.
- Fog Nozzle Co.
- Green Head Bit & Supply Co.
- Wilson Manufacturing Co.

R. J. Eiche

228 Forty-third St.
Manhattan Beach, Calif.

- The Cavins Co.
- Crum-Brainhard Co., Ltd.
- Chiksan Tool Co.
- Eastman Oil Well Survey Corp.
- Eason-Therolf Tool Co.
- Hamer Oil Tool Co.
- Hopper Machine Works, Inc.
- Non-Corrosive Products Co., Ltd.
- Specialty Oil Tool Co.
- Web Wilson Oil Tools

Lloyd G. Ensign

30 Rockefeller Plaza, New York, N. Y.
South American Representative:

William H. Kennedy & Co.
Port-of-Spain, Trinidad.

- Broderick & Bascom Rope Co. (Trinidad)
- Brauer Machine & Supply Co.
- Grant Oil Tool Co.
- Hercules Tool Co.
- Line Scale Co., Inc.
- Lee C. Moore & Co., Inc.
- Poist Tool Co.
- Nowery J. Smith Supply Co.

Export Tool Co.

Thad L. Putnam
74 Trinity Place, New York, N. Y.

- Abercrombie Pump Co.
- Cameron Iron Works, Inc.
- Gearench Manufacturing Co.
- Kinzbach Tool Co.
- Merco Centrifugal Co.
- Otis Pressure Control
- Walter Ruska & Co., Inc.

General Machinery & Supply Co., S. A.

P. O. Box 258, Tampico, Mexico.
I. B. Sutton, president.
F. E. Muller, manager.

W. R. Grace & Co.

7 Hanover Square, New York, N. Y.

International Machinery Co.
Caixa Postal 20, Rio de Janeiro, Brazil.

International Machinery Co.
Santiago, Chile.

International Machinery Co.
Ando Fagasta, Chile.

International Machinery Co.
Lima, Peru.

International Machinery Co.
Oruro, Bolivia.

- Athey Truss Wheel Co.
- Bucyrus-Erie Co.
- Cardwell Manufacturing Co., Inc.
- Caterpillar Tractor Co.
- Clyde Iron Works
- Ingersoll-Rand Co.
- International General Electric Co.
- La Plant Choate
- E. J. Longyear Co.
- Novo Engine Co.
- Sharples Specialty Co.
- Waukesha Motor Co.

Hughes Tool Co.

W. H. Siems, export manager.
30 Rockefeller Plaza, New York, N. Y.
South American offices:
J. W. Des Champs
Calle Defensa 320
Buenos Aires, Argentina.
S. R. Chambless
P. O. Box 117, Port-of-Spain, Trinidad.

Industrial Agencies, Ltd.

Trinidad, B. W. I.
M. J. Thompson, managing director.

Representing:

- Axelson Manufacturing Co.
- Buda Co.
- Chiksan Tool Co.
- Jensen Brothers Manufacturing Co.
- Jeffrey Manufacturing Co.
- Mineral Products Corp.
- Oil Well Manufacturing Corp.
- Wilson Manufacturing Co.

International Derrick & Equipment Division of International Stacey Corp.

A. O. Woracek, export sales manager.
21 West St., New York, N. Y.

J. Arthur Moore

342 Madison Ave., New York, N. Y.

- Alten's Foundry & Machine Works
- Daniel Orifice Fitting Co.
- Jerguson Gage & Valve Co.
- John Zink Co.

W. C. Norris, Manufacturer, Inc.

E. M. Hurtado, export manager.
277 Broadway, New York, N. Y.

Oilfield Equipment Co.

Thomas E. Ward, president.
30 Church St., New York, N. Y.

Associates in South America:

Alston & Co., Ltd.
Port-of-Spain, Trinidad, B. W. I.

Jose Sanchez
Calle Defensa 320
Buenos Aires, Argentina.

- Braden Winch Co.
- Columbian Steel Tank Co.
- Diamond Metal Co.
- Halliburton Oil Well Cementing Co.
- McEvoy Co.
- Packing Engineering Corp.
- Sullivan Co.
- Watson-Stillman Co.
- Whitney Chain & Manufacturing Co.

Oil Industry Appliances Co.

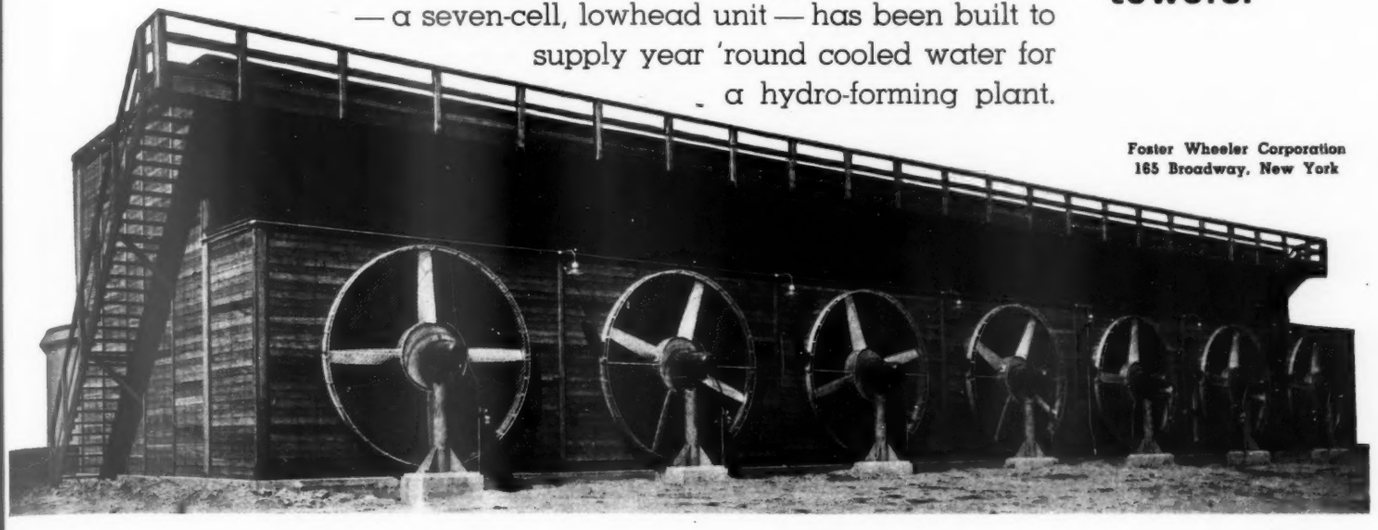
Walter S. Fellows
92 Liberty St., New York, N. Y.

(Continued on Page 162)

Repeat Mechanical Draft Cooling Tower

Four years ago, this refiner, then operating two 1,000-ft. atmospheric towers, equipped a polymerization plant with a forced draft cooling tower. Experience with mechanical draft has been so satisfactory that the tower shown below — a seven-cell, lowhead unit — has been built to supply year 'round cooled water for a hydro-forming plant.

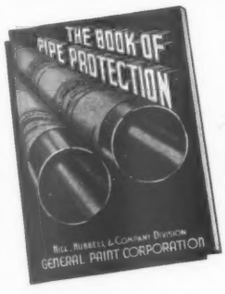
—for user of the largest atmospheric towers.



Foster Wheeler Corporation
165 Broadway, New York

FOSTER WHEELER

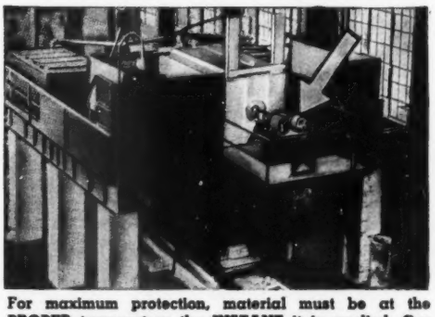
ENGINEERS PREFER The HILL-HUBBELL "factory process"



A request on your letterhead will bring a copy of "Pipe Protection" which describes our process in detail.

Buy STEEL PIPE Mill Coated - and - Wrapped at any of these Mills
Jones & Laughlin Steel Corp.
National Tube Company
Republic Steel Corporation
Spang Chalfant, Inc.
The Youngstown Sheet & Tube Company

Engineers prefer the HILL-HUBBELL "factory process" for Coating-and-Wrapping STEEL PIPE because the best material won't protect unless it is PROPERLY applied. The HILL-HUBBELL "factory process" is, without question, the most effective method known today for applying Pipe Protection. All work is done INDOORS under ideal conditions. It is done MECHANICALLY which assures maximum efficiency. The HILL-HUBBELL "factory process" costs no more.



For maximum protection, material must be at the PROPER temperature the INSTANT it is applied. Our STATIONARY Kettles are equipped with Automatic Temperature Control to protect coating materials from destructive overheating. They are also equipped with motor-driven Mechanical Agitators to keep mineral fillers in constant suspension.

Schematic Construction of Specification TAX-1

GENERAL PAINT CORPORATION
HILL, HUBBELL & CO. · Division · Cleveland, Ohio
· EXPORT OFFICE SAN FRANCISCO, CALIFORNIA, U. S. A. ·

DIRECTORY OF EXPORT ORGANIZATIONS

(Continued from Page 160)

Baldwin-Duckworth Chain Div., Chain Belt Co.
Grip-Tite Mfg. Co.
Gulf Coast Machine & Supply Co.
Patterson-Ballagh Corp., Ltd.
Pennington Signaling Core Barrel
R. F. Electrical Mfg. Co.
Standco Brake Lining Co.
Standco Bolt Co.
Trumble Oil & Gas Separators

Parkersburg Rig & Reel Co.

James A. Thomas, export manager.
19 Rector Street, New York, N. Y.
Baker Oil Tools Co., Inc.
The S. M. Jones Co.
Oil Country Specialties Mfg. Co.
Parkersburg Rig & Reel Co.

Petroleum Machinery Corp.

W. J. Campbell, president
30 Rockefeller Plaza, New York, N. Y.
San Fernando, Trinidad, B.W.I.
P. O. Box 52

Buenos Aires, Argentina
Reconquista 165

Caracas, Venezuela
Sur 25—Los Caobos

Representing:
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American Pipe & Steel Corp.
American Sand Banum Co.
Atlas Engineering Co.
Bettis Rubber Co.
Bradford Motor Works
Burns Tool Co.
Chicago Pneumatic Tool Co.
Cooper-Bessemer Co.
Darling Valve & Mfg. Co.
G. & O. Mfg. Co.
G. & W. Electric Specialty
Grove Regulator Co.
Kobe, Inc.
Thomas Laughlin Co.
Natural Gas Equipment, Inc.
Newman-Hender Co.
Okonite Co.
Osage Metal Co.
Overstrom & Sons
Service Caster & Truck Co.
Triad Products, Inc.
Turbolite, Inc.
Unit Rig & Equipment Co.
Universal Engineering Co.
West American Rubber Co.

Reed Roller Bit Co.

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30 Rockefeller Plaza, New York, N. Y.

Shaffer Tool Works

Charles E. Geddes
30 Rockefeller Plaza, New York, N. Y.

Shand and Jurs Co.

Ralph F. Ley, eastern div. mgr.
295 Madison Avenue, New York, N. Y.

A. V. Simonson

149 Broadway, New York, N. Y.
The Buda Company
Franks Mfg. Corp.
Gaso Pump & Burner Mfg. Co.
Hinderliter Tool Co.
Lufkin Foundry & Machine Co.
McKissick Products

L. D. Sola
Sola-Ferguson, Ltd.

Chanin Building, New York, N. Y.
American Cleaning Equipment Co.
The Debevoise Co.
Delloy Metal Co.
Gates Rubber Co.
Graver Tank Co.
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Caisson-Type Foundations In Lake Maracaibo

(Continued from Page 77)

is vertical. When the point is set in the soft mud at the correct location the caisson is filled with water to offset its tendency to float. This buoyancy aids the cranes in placing the piles. After being filled with water, the pile is literally "spudded" through the soft mud until it rests on the solid clay bottom.

Since these caissons are too large and too heavy, each weighing approximately 80 tons, to drive with the conventional steam hammer, the dead-load method of driving was adopted. The load to be carried, 100 tons each, is small compared to that carried by a conventional caisson of comparable size. Precast concrete weights, aggregating 200 tons in weight which is double the necessary carrying capacity, are placed on the piles by the floating cranes. The dead-load method definitely establishes the load-carrying capacity of the soil in which the pile is embedded and at the same time eliminates elaborate and time-consuming soil tests. It likewise insures the use of the shortest possible caisson that will give a safety factor of two. The manner in which the load is applied is shown in Fig. 6.

When the piles are in place they reach a depth of as much as 175 ft. below the surface of the lake. The derrick floor is 10 ft. above the surface of the water and in instances in which the caisson does not reach that height it is necessary to add another section. In Fig. 7 sections are being added to two piles while a third is being driven by the 200-ton load. The caisson in the left foreground is ready for grouting after being welded while a 15-ft. section is being placed on pile in rear.

The derrick foundation is designed as a rigid frame structure, obtained by connecting the four piles with arch-shaped welded plate girders. The girders are clamped to the cylinders by steel sleeves so that they can be installed immediately after the piles are set. This precaution is taken to protect the piles from sudden storms and to prevent a breaking or twisting movement that might be caused by the powerful current of the deep water.

Fig. 10—Derrick is erected, and job is complete

The foundations are completed by cutting the piles to grade, as shown in Fig. 8, and sealing them with a concrete cap. The steel base which supports the derrick and drilling equipment is set in the concrete caps. Fig. 8 also shows the concrete mixer and the forms for the caps on the foundation.

An 18-ft. cantilever extension of the 36-in. steel beams of which the base is constructed supports the drilling engine, and a similar but shorter extension on the opposite side is used to support the pump when pumping the well becomes necessary. These extensions are visible in Fig. 9 which shows preliminary work in the erection of the derrick. The engine house, fully equipped from the engine to the lazy bench, is placed on the extension by the crane and bolted into place. A 100-ft. power barge, containing boilers, slush pump, mud pit, vibrating screen and pipe rack with storage space for mud-weighting materials and boiler fuel is towed to the foundation to complete the setup. The barge-mounted equipment and the unit engine house reduce rigging-up time to a minimum so that it is possible to start spudding a second well with the same equipment on the same day that one is completed.

The caisson-type piling has proved successful under all conditions to which it has been subjected so far. However, it is frequently changed both to include improvements and to meet local location conditions. It does not lend itself to standardized specifications because of the variables that are encountered such as location of the point of fixation and the amount of lateral support in the soft mud. An additional consideration is the possibility of synchronization between the harmonic periods of the foundation, the drilling equipment and the movement of the water, especially during storms. Since it is possible to alter not only the length but also the diameter of the piles to meet local conditions, no difficulty has been experienced in constructing the foundations under conditions encountered up to the present.

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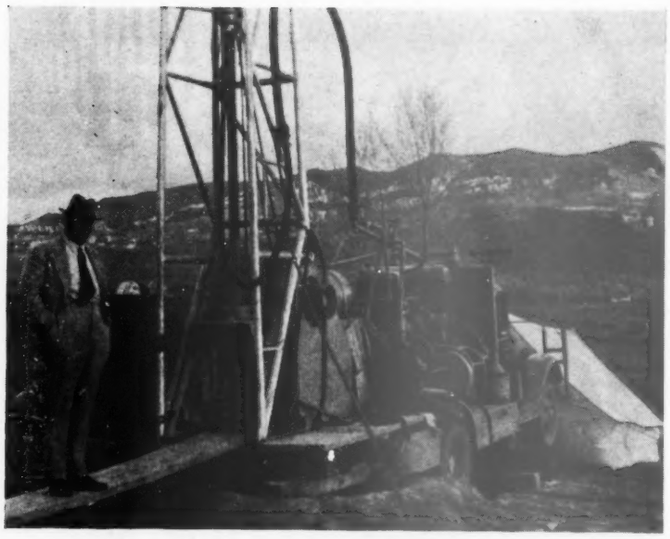


Small, highly portable rig used for stratigraphic testing

Pequeño aparejo de perforación, de tipo muy portátil, usado para ensayos estratográficos

Exploration, Exploracion,

EXPLORATION is gradually ceasing to mean exclusively the search for new oil deposits and is increasingly including the determination of methods of recovering more oil from already known occurrences. The search for new structures continues, but along with it there is a growing search for methods of utilizing to the fullest extent the possibilities of structures already drilled.

Search for New Fields

The literature contains many references to the role played by the various exploratory sciences in the discovery of new fields. Many attempts are made to credit discoveries to different exploratory methods. Frequently such statements are open to criticism on the ground that they favor the particular branch of science in which the estimator is most interested. Actually, few discoveries can be credited to any single branch of exploratory science. Those which result from drilling on scientific data have been outlined by one method or another and checked by still different methods. Whether the seismograph preceded the gravimeter or both followed surface or subsurface geology is more or less a matter of accident. One method outlines a possible structure and this is confirmed or not by others. Drilling follows an analysis of the results of all methods.

Indirect Methods of Discovering Oil

Most exploratory methods are indirect, in that they attempt to locate structures which may contain oil. These have undergone little change during recent years. Surface geology, subsurface geology, seismic, gravity and magnetic methods of geophysical prospecting have all been refined, but are fundamentally the same as they have been for a number of years.

There is, however, a noticeable trend in the use of the various methods of exploration and, particularly, in the interpretation of the results obtained by these methods. The geologist is gradually becoming less a seeker of facts than an interpreter of the facts assembled for him by experts in the various scientific and technical branches of the industry.

Magnetic, gravitational or seismic anomalies are reported to central bureaus or headquarters where they are correlated and interpreted. In some companies duplicate records of all readings are sent to a central headquarters. The field set is interpreted in the field and district offices and a report sent to headquarters. The central organization makes its independent interpretation and differences are then reconciled and a closer approxi-

LA exploración está gradualmente dejando de ser un mero acto de buscar nuevos yacimientos petrolíferos. De una manera creciente está incluyendo la averigüación de métodos de recuperar más petróleo de los yacimientos ya conocidos. Continúa, por supuesto, la busca de nuevos yacimientos, y con ella se presenta un estudio contínuo de métodos relativos a la mayor utilización factible de las posibilidades de los yacimientos ya perforados.

En busca de nuevos campos

Los informes por escrito contienen muchas referencias al papel desempeñado por las varias ciencias de exploración en el descubrimiento de nuevos campos. Muchos están tratando de de asignar los descubrimientos a determinados métodos de exploración. A menudo, semejantes declaraciones quedan sujetas a crítica, sobre la base de que favorecen la particular ramificación de la ciencia en que observador o estudiante está personalmente más interesado. En efecto, muy pocos descubrimientos pueden acreditarse a una sola ramificación de la ciencia exploradora. Aquellos que resultan de la perforación, basada sobre datos científicos, han sido emprendidos de acuerdo con un método determinado y verificados después de acuerdo con otros diferentes métodos. De que el sismógrafo preceda al gravímetro, o de que ámbos sigan la geología superficial o subterránea, es cosa más o menos de accidente. Un método podrá señalar una posible estructura y esto se confirmará o no por otros. La perforación sigue al análisis de los resultados de todos los métodos.

Metodos indirectos de descubrir petroleo

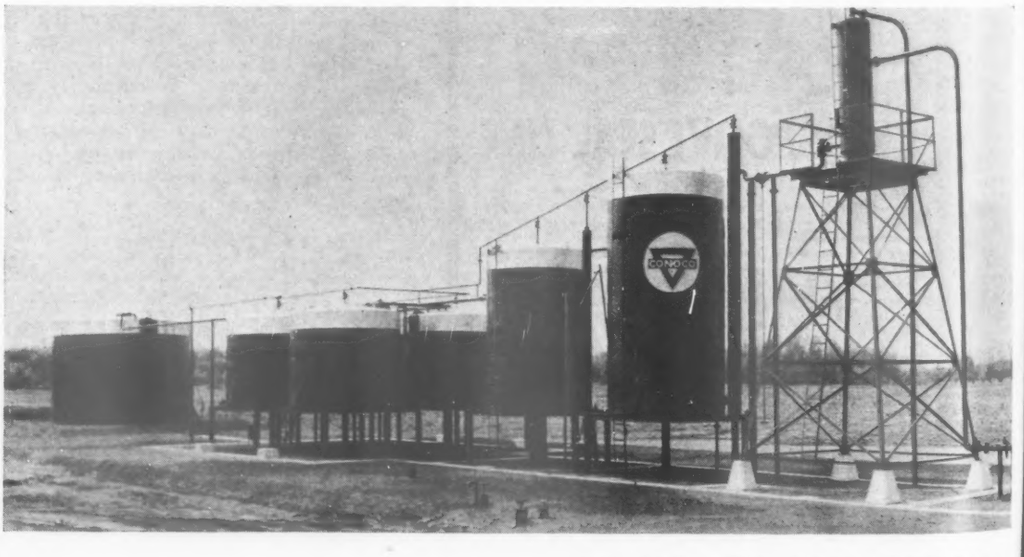
Casi todos los métodos de exploración son indirectos, en el sentido de que tratan de localizar las estructuras que pudieran contener petróleo. Han sufrido muy poco cambio estos últimos años. La geología superficial, la geología subterránea, los métodos sísmicos, de gravedad y magnéticos de exploración geofísica, todos se han refinado, pero fundamentalmente son los mismos que han existido desde hace muchos años.

Existe, sin embargo, una tendencia notable hacia el uso de varios métodos de exploración, y particularmente, hacia la interpretación de los resultados que con ellos se consiguen. El geologista, en lugar de ser un indagador de hechos, es más bien ahora un intérprete de los hechos o datos que le presentan los expertos en las varias ramificaciones científicas y técnicas de la industria.

La anomalías magnéticas, de gravitación o sísmicas se reportan a

A tank battery elevated by steel subbases in order to avoid the possibility of having tanks float away in a flood

Una batería de tanques elevados en bases inferiores para evitar la posibilidad de que los tanques se despredan y pierdan en una anegación



Drilling and Production

Perforacion y Produccion

mation to a true knowledge of the facts is thus afforded. Often a check by a different method is considered advisable before definite recommendations can be made.

Where a company has parties working in many areas, methods employed in one can be applied to another by the central staff whereas the field force might remain in ignorance of the possibilities of the other approach to the problem.

Geophysical Prospecting

Recent years have seen no fundamental changes in the principles of physical prospecting but have witnessed an ebb and flow in the use of each of the three main types as new instruments, improved methods or refinements in interpretation have been developed.

The reflection seismograph continues to be the most widely used instrument although its use was on the decline in most settled areas until recently it was found that minor structures along shore-line trends such as the Wilcox and Frio-Vicksburg of the Gulf Coast could be picked up by this method. The result has been the resurveying of many areas which were formerly not favorably regarded.

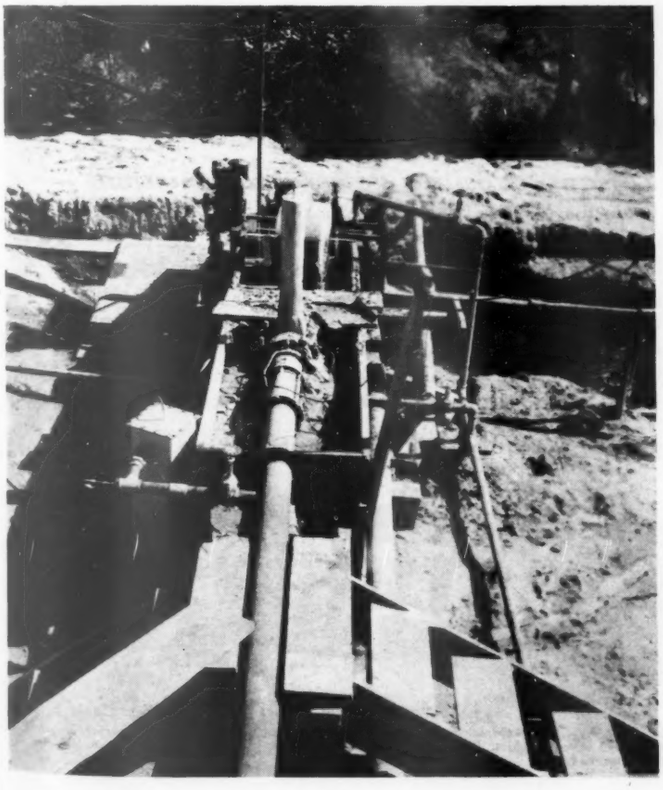
The reflection seismograph has been widely used in the play in Mississippi and other eastern Gulf states without conspicuous success. Here attention is turning to core drilling as a means of better locating productive structures.

The use of the torsion balance has almost completely ceased but the gravimeter has more than taken its place as there is a decided increase in gravity surveys, owing to the cheapness of this method. One company claims to have picked up a score of salt domes in as many weeks in the eastern Gulf area, although

(Continued on Page 170)

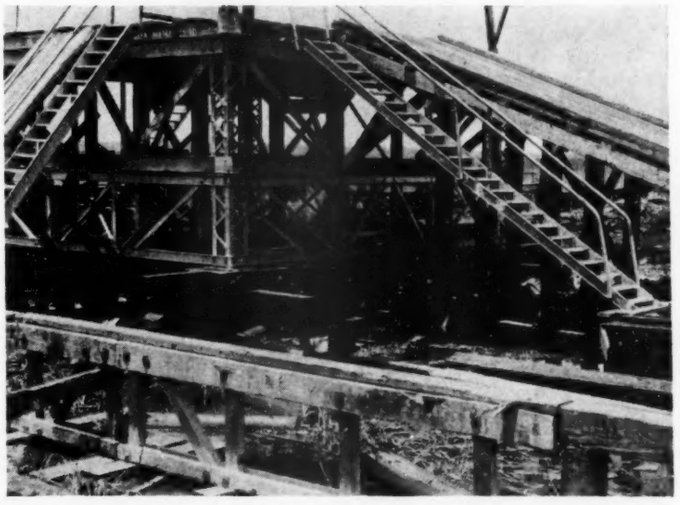
Presence of gas in mud from drilling well is detected by passing part of the fluid through a chamber with a vacuum line attached to it

La presencia del gas en el lodo o barro de la perforación de un pozo se averigua pasando parte del líquido por una cámara provista de un tubo de vacío



oficinas centrales donde son correlacionadas e interpretadas. Algunas compañías envian copias exactas de sus observaciones a estas oficinas centrales. Los resultados en el mismo campo se interpretan ahí mismo y en oficinas regionales, enviándose un informe a las oficinas centrales. La organización central hace una interpretación independiente y las diferencias se reconcilian entonces, obteniéndose así mayor aproximación a un conocimiento exacto de la situación. A menudo, se recurre a una verificación por un método diferente, antes de hacer recomendaciones finales.

El sismógrafo de reflexión continúa siendo el instrumento de mayor utilización, a pesar de que su uso estuvo en declinación en las regiones más pobladas, hasta que recientemente se vió que estructuras menores podían averiguarse a lo largo de la costa, como en Wilcox y Frio-Vicksburg, en la Costa del Golfo. El resultado ha sido una nueva exploración y estudio de muchas regiones que anteriormente no se tenian por favorables.



Special foundation built under derrick prevents it from settling in marshy ground

Base especial construida debajo de una torre de perforación, que evita el hundimiento de esta última en terreno pantanoso

Cuando la compañía tiene varias cuadrillas trabajando en muchos puntos, los métodos empleados en uno pueden aplicarse a otro, por el personal de la oficina central, en lugar de que el personal de campo quede en ignorancia de las posibilidades de abordar el problema con otros procedimientos.

Exploracion geofisica

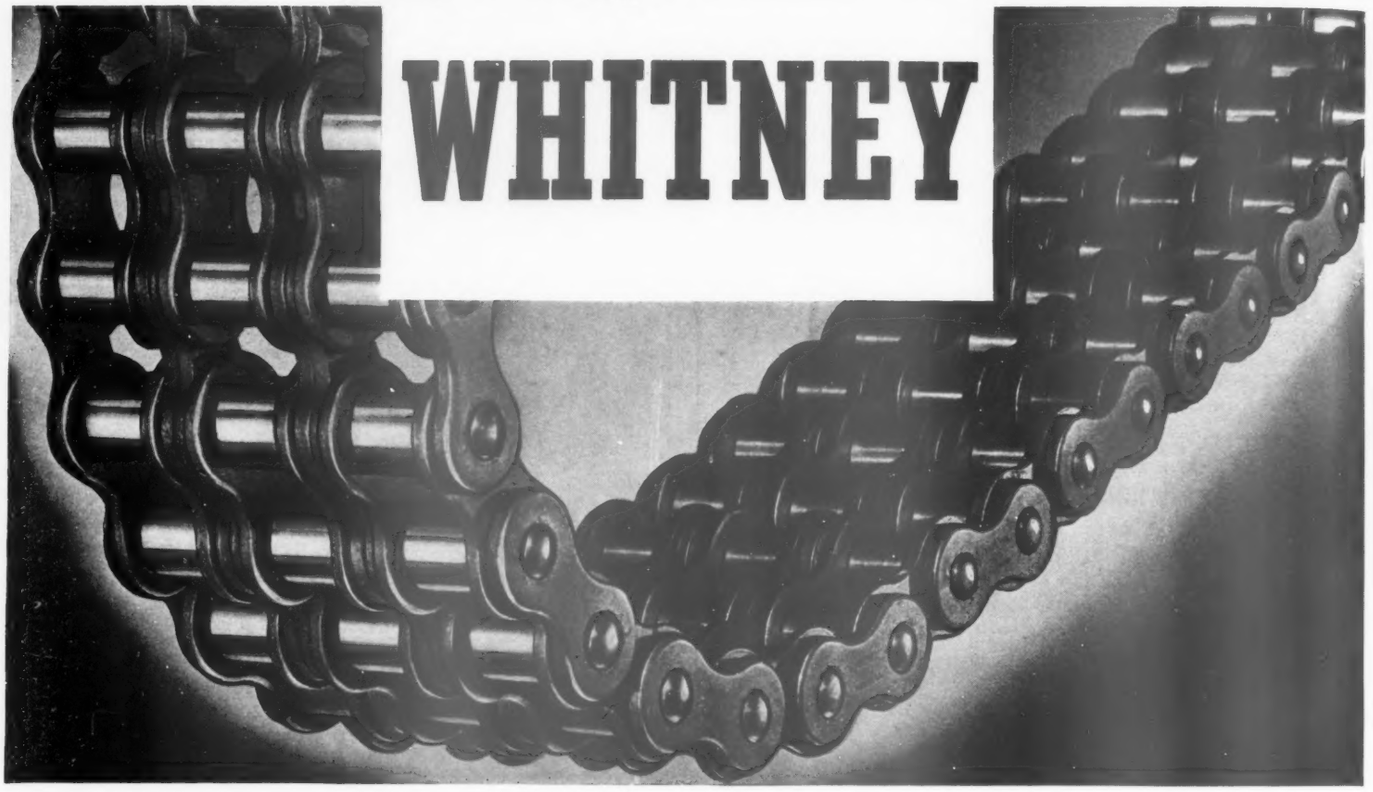
Los años recientes no han presenciado cambios fundamentales en los principios de la exploración geofísica, pero hemos visto un movimiento alternativo de subida y baja en el uso de los tres tipos principales, a medida de que se han perfeccionado nuevos instrumentos, y desarrollado mejores métodos o refinamientos en las interpretaciones.

El sismógrafo de reflexión se ha usado much en exploraciones en Mississippi y otros estados del este al borde el Golfo, pero sin éxito sobresaliente. La atención se está aquí concentrando en la perforación de núcleos o muestras, como medio de descubrir las estructuras productivas.

El uso de la balanza de torsión ha desaparecido casi por completo, pero el gravímetro ha más que tomado su lugar, pues existe un creciente trabajo de exploración por gravedad, debido a la economía de este método. Una compañía dice que ha descubierto una veitena de depósitos salinos en igual número de semanas en la región del este del Golfo, a pesar de que ninguno de ellos ha resultado productivo hasta el presente.

Los estudios magnéticos se efectúan en muchos lugares, pero la principal dificultad que se presenta con ellos es su correcta interpreta-

(Continue en Pagina 170)



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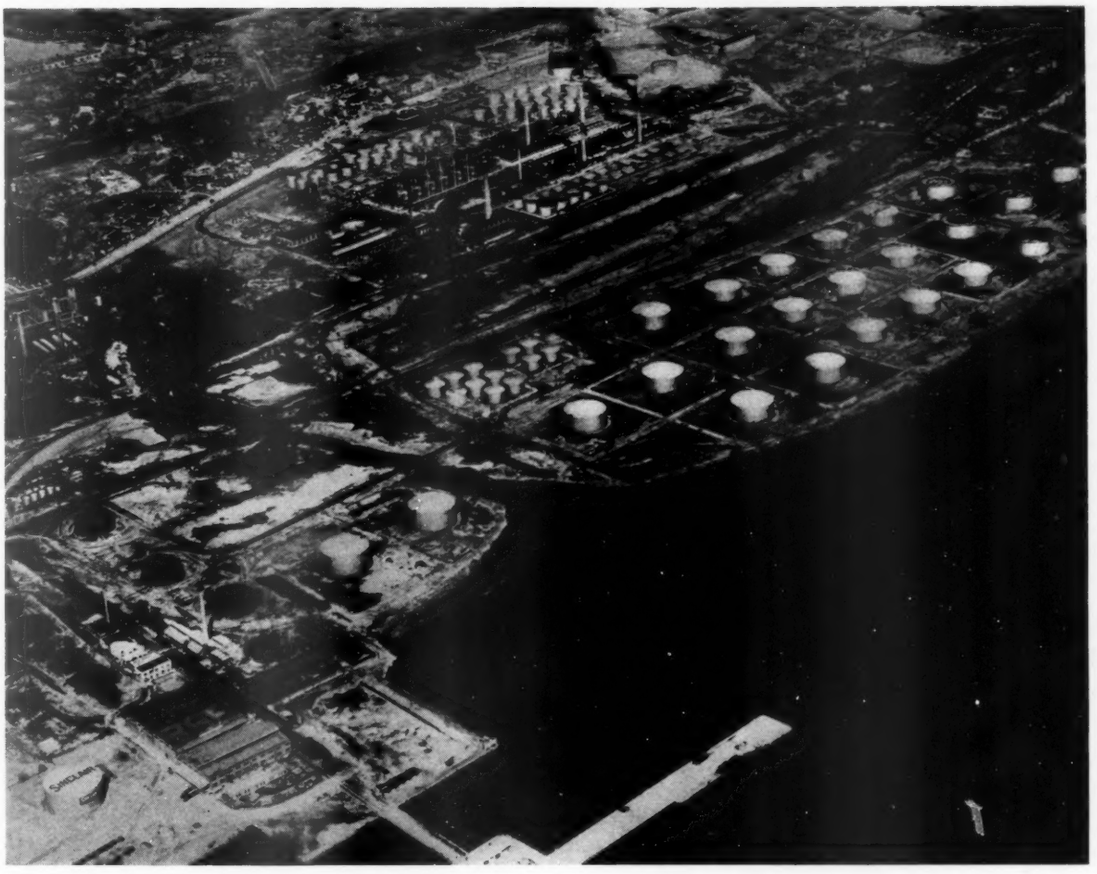

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(Continued from Page 167)

none of these have proved productive up to the present time.

Magnetic surveys are carried on in many places but the chief difficulty encountered by magnetic surveys is the difficulty of interpretation. The magnetic properties of sedimentary rocks are being studied in detail and as these progress magnetic prospecting may again become widely used.

The Time Element in Prospecting

There is a constantly growing tendency to take out large blocks of acreage rather than to attempt to checkerboard all areas where there appears to be a possibility of activity. This tendency is increased by the greater depths to which drilling is carried on. Obviously a 10,000-ft. well requires greater protection in acreage than a 2,000-ft. test.

This leads naturally to more detailed prospecting and a more careful check before operations commence. The widespread growth of proration, or state-allocated ratable taking as well as the current surplus of proven reserves increases this tendency. Where there is no possibility of drilling a well and rifling the producing horizon of large quantities of oil before the offset can be completed, it is better practice to spend more time on preliminary activity prior to drilling, or even leasing.

Obscure Structures and Stratigraphic Traps

Other factors which are leading to slower rates of development are the rapidly decreasing number of easily found structures and the increasing number of fields in which oil occurs in stratigraphic traps. Structures which are not reflected at the surface and wedge edges containing oil can be found only by chance or after a prolonged period of geological investigation. Generally, this investigation consists of the collection and correlation of all kinds of factual data from wells drilled in the district under consideration.

Paleogeography, or the study of the areal distribution of formations of different ages, is becoming of increasing importance, but in addition, there is involved a more intense examination of the lithologic and faunal characteristics of the different formations in an attempt to deduce the position of shorelines and of highs, both structural and depositional.

One result of this study is a reexamination of the fundamentals of sedimentation and an increasing number of petroleum geologists consider that the principles of sedimentation constitute the most pressing research problem at the present time.

Of nearly equal importance is the question of the origin and mode of accumulation of oil. Research during the past few years has disclosed weaknesses in previously held conceptions on these subjects as well as a need for their clarification. Generalizations which led to the condemnation of certain structures because of an inadequate drainage area have been disproved by operators who either did not know or did not believe these generalizations, with the result that much new oil has been found.

Correlation of Composition of Oil With Stratigraphy

Recently, chemists and geologists working cooperatively have worked out a classification of oils which supersedes the old "paraffin naphthene and intermediate base" categories. By correlating the density and average boiling points of the different fractions obtained by Hempel analysis, they have been able to assign definite index numbers to each fraction which are a measure of the paraffinicity and naphthenicity of the oil. It has been found that there are definite groupings of oils in some cases in different sands in the same field and in other cases in the same sand in neighboring fields. This may eventually lead to generalizations concerning the origin of oil but is probably more promising from a practical standpoint in determining trends, both stratigraphic and structural, along which new fields may be found.

Logging Methods

Coexistent with the need for more information regarding the subsurface formations for geological purposes is an increasing demand for information regarding the physical characteristics of rock formations in order to increase the efficiency of production methods. As the rotary rig is more completely replacing the cable-tool rig in drilling operations, this information is harder to obtain.

The tendency, therefore, has been to substitute indirect methods of stratigraphic analysis for direct methods and, at the same time, to refine methods of cutting and core analysis so that greater accuracy of correlation may be obtained.

In addition to the increased need for stratigraphic information, there is also a growing realization of the need of accurate determinations of the content of porous formations traversed by the bit. Too many times in the past have productive sands been mudded off and gone unnoticed only to have a later test disclose their presence.

With the exception of purely geological methods such as the use of micropaleontology and the lithologic examination of cuttings, most well-logging methods serve both the geologist and the production engineer.

Electric Logging and Core Analysis

Electric logging and core analysis have been discussed in previous editions of this annual review of progress and need not be considered here, except to point out that in some areas they have become as rou-

(Continue desde Pagina 167)

ción. Las propiedades magnéticas de las rocas sedimentarias se están estudiando en detalle, y a medida que progresen estos estudios, la exploración magnética se utilizará mucho de nuevo.

El elemento del tiempo en la exploracion

Existe una creciente tendencia hacia cubrir una gran extensión de terreno, en lugar de tratar de cubrir limitados espacios en diversos terrenos donde se presente una posibilidad de actividad. Esta tendencia se acrecienta por las mayores profundidades del sondaje. Es evidente que un pozo de 10.000 piés de profundidad requiere mayor protección en extensión terrenal que otro de ensayo o prueba de 2.000.

Esto naturalmente conduce a una exploración más detallada y a una verificación más cuidadosa antes de comenzar el trabajo. El gran desarrollo del prorrateo, o la asignación oficial de terrenos, lo mismo que el surplus corriente de reservas demostradas, viene a aumentar esta tendencia. Donde no existe la posibilidad de perforar un pozo y llegar al horizonte de producción de grandes cantidades de petróleo antes de completar la inclinación, es mejor práctica dedicar más tiempo a la actividad preliminar, antes de la perforación, o de entrar en arriendo.

Estructuras oscuras y trampas estratigraficas

Otros factores que están conduciendo a más lento régimen de desarrollo son el decreciente número de estructuras de fácil descubrimiento y el creciente número de campos en que el petróleo se presenta en trampas estratigráficas. Las estructuras que no se reflejan en la superficie y los puntos ocultos que contienen el petróleo, se descubren sólo por casualidad o después de un prolongado período de investigación geológica. Generalmente, esta investigación consiste en una colección y correlación de toda clase de informes y datos de pozos perforados en la zona bajo consideración.

La peleografía, o estudio de la distribución regional de formaciones de diferentes edades, está creciendo en importancia, pero, en adición, se comprende aquí un examen más intenso de las características litológicas y de la fauna de las diferentes formaciones, con el fin de deducir la posición de los límites horizontales y verticales, en lo tocante a estructura y acumulación.

Un resultado de este estudio es el examen más detenido y profundo de los principios fundamentales de la sedimentación, y un creciente número de geólogos de petróleo consideran que los principios de la sedimentación constituyen el más importante problema de investigación, al presente.

De casi igual importancia es el asunto del orígen y modo de acumulación de petróleo. Los estudios estos últimos años han revelado errores en los conceptos sobre estos temas, hasta ahora sostenidos, lo mismo que la necesidad de su clarificación. Las generalizaciones que condujieron a condenar ciertas estructuras, a causa de una inadecuada area de desagüe, han sido desaprobadas por los explotadores, quienes no las conocían, o bien, no tenían confianza en ellas, con el resultado de que se han descubierto nuevos yacimientos de petróleo.

Correlacion de la composicion del petroleo con la estratigrafia

Recientemente, los químicos y geólogos, trabajando cooperativamente, han desarollado una clasificación de petróleos que viene a reemplazar a las antiguas categorias de "parafina nafatalina y base intermedia." Correlacionando la densidad y los puntos de ebullición promedios de las diferentes fracciones obtenidas por el análisis de Hempel, han podido asignar definidos números de índice a cada fracción, los cuales representan una medida de la parafinicidad y naftenicidad del petróleo. Se ha visto que hay agrupaciones definidas de petróleos, en algunos casos, en diferentes arenas en el mismo campo, y en otros casos, en la misma arena en campos cercanos. Esto podrá, con el tiempo, conducir a generalizaciones concernientes al orígen del petróleo, pero probablemente es más prometedor desde un punto de vista práctico, para la determinación de tendencias, tanto estratígrafas como estructurales, en virtud de las cuale podrán descubrirse nuevos yacimientos.

Metodos de informes diarios de perforacion

Coexistente con la necesidad de más información sobre las formaciones subterráneas, para los fines geológicos, se presenta una creciente demanda de información relativa a las características físicas de las formaciones de roca, para aumentar el rendimiento de los métodos de producción. En vista de que el equipo rotatorio está reemplazando, casi del todo, al equipo de herramienta de cable, en los trabajos de perforación, se hace más difícil obtener esta información.

Por esta razón, la tendencia ha sido hacia la substitución de los métodos directos por los métodos indirectos de análisis estratigráficos, y al mismo tiempo, hacia el perfeccionamiento de métodos de sacar muestras y de analizarlas, para obtener mayor exactitud en la correlación.

En adición a la creciente necesidad de información estratigráfica, existe también un creciente entendimiento de la necesidad de exactas determinaciones del contenido de las formaciones porosas atravezadas por la sonda. En numerosos casos en el pasado, las arenas productivas se han embarrado y pasado desapercibidas, hasta que su presencia se ha

tine as the keeping of a driller's log. During the past year studies have been made as to the way in which these methods supplement one another.

The electric log may be affected by several factors which are not directly related to the characteristics of the formation studied. Among these are changes in the salinity of the mud which may result from the influx of salt water at some point up the hole. Increasing the weight of the mud often intensifies the peaks and chemicals added to increase viscosity may also change the resistivity and self-potential curves in the same way as changes in salinity, although in varying degree.

Electrode spacing also affects the curves, although spacing is now more uniform than it formerly was and, hence, this complication is becoming less serious.

Abnormally high formation pressures may obliterate the normal effect of a porous formation on the self-potential curve through reversal of filtration.

Sometimes a very dense sand will give the same effect as a porous oil-filled sand. On the other hand a high connate-water content may mask the presence of oil in commercial quantities.

As many of these effects are regional they do not affect materially the value of the electric log for purposes of correlation and structural determination. They do, however, greatly affect its value as a means of diagnosing sand conditions.

Core analysis yields more information concerning the contents of the porous formations, but these may be contaminated by drilling water or some of the contents may be forced from the core during removal. Chipping off the external portions and examining the center only does not completely remove these complicating factors.

Logging of Formations While Drilling

Electric logging while drilling is obviously an application of a principle already in use, electrical surveying of the holes. The main advantage of logging as the formations are penetrated is that a test can be made immediately after a possible producing horizon is encountered. It is also possible to check the drilling of pay formations and stop the drill at the first sign of water.

The equipment consists of specially constructed kelly, drill pipe, tool joints and drill collars. Recording and control equipment are centered in a house trailer, waterproof cables connecting the instruments to associated parts on the derrick floor. The

Mixing a regenerated cellulose material in cement for the purpose of sealing porous formations

Mezclando un material de celulosa regenerada en cemento con el objeto de tapar formaciones porosas

delatada por ensayos posteriores.

Con la excepción de los métodos puramente geológicos, tales como el uso del exámen de muestras valiéndose de la micropaleontología y litología, los más conocidos métodos de informes diarios de perforación sirven todavía ventajosamente al geólogo y al ingeniero de producción.

Informes por metodo electrico y analisis de muestras

Los informes por método eléctrico y el análisis de muestras se han tratado en anteriores ediciones de esta revista anual del progreso de la industria, y no hay necesidad de repetirlo aquí, salvo para señalar que en ciertas regiones se han convertido en una rutina tan común como los informes de perforación diaria. Durante el año pasado se han hecho estudio con el fin de ver cómo estos métodos se suplementan mutuamente.

El informe eléctrico puede ser afectado por varios factores, los cuales no están directamente relacionados con las características de la formación estudiada. Entre estos factores se encuentran los cambios en salinidad del barro, que puede resultar del influjo de agua salada en algunos puntos del agujero. El aumento del peso del barro a menudo intensifica la salinidad y las substancias químicas añadidas para aumentar la viscosidad pueden también cambiar las curvas de resistividad y potencial del mismo modo que los cambios en salinidad, pero en grado variable.

La separación de electrodos afecta también a las curvas, a pesar de que ella es ahora más uniforme que antes, lo que hace menos seria esta complicación.

Las presiones anormalmente intensas de la formación podrán borrar el efecto normal de una formación porosa en la curva de potencial. debido a la inversión de la filtración.

A veces, una arena muy densa dará el mismo efecto que una arena porosa llena de petróleo. Por otra parte, un alto contenido inherente de agua podrá tapar la presencia de petróleo en cantidades comerciales.

Como muchos de estos efectos son regionales, no afectan mucho el valor del informe eléctrico, para los fines de la determinación estructural y correlación. Sin embargo, afectan mucho su valor como medio de determinar las condiciones de la arena.

El análisis de muestras produce más información sobre el contenido de las formaciones porosas, pero éstas podrán estar contaminadas por agua de perforación o parte del contenido podrá escaparse de la muestra durante su extracción. El quitar las porciones exteriores y examinar el centro solamente no aparta estos factores de complicación.

Informe sobre formaciones durante la perforacion

El informe eléctrico, mientras se está perforando, es, por supuesto, una aplicación de un principio que está ya en uso: el estudio eléctrico de los agujeros. La ventaja principal del informe eléctrico, mientras se están perforando las formaciones, está en que puede hacerse un ensayo inmediatamente después de encontrado un posible horizonte productor. También es posible verificar la perforación de formaciones de paga y parar la herramienta a la prinera indicación o indicio de agua.

El equipo consiste en un kelly de construcción especial, tubo de perforar, uniones cónicas y collares de perforación. El equipo de registro y de gobierno están centrados en un sitio a propósito, habiendo cables impermeables para conectar los instrumentos con los dispositivos correspondientes en el piso de la torre. El kelly está dispuesto de modo que contiene un cable eléctrico, que se conecta a una caja montada inmediatemente debajo del buje giratorio.

El circuito eléctrico para el informe de perforación se establece entre la caja a la broca por medio de una sección de cable dentro de un conducto soldado en la parte interior del tubo de perforación. La conexión eléctrica entre las uniones se efectúa mediante pares de bornes eléctricos especialmente construidos, de posición fija y de permanente montaje en las uniones cónicas de la herramienta. Cuando se atornillan estas uniones, los bornes se enganchan y al mismo tiempo aislan el circuito de la corriente de barro.

El collar de perforación está especialmente construido para aislar la broca del tubo de perforación, para que la broca pueda así servir de electrodo. Una sección de baquelita de 10 pies inmediatemente arriba de la broca, provee el aislamiento necesario. Las brocas usadas son de tipo normal.

El equipo no es complicado y una cuadrilla de trabajadores puede aprender, en poco tiempo, a manejarlo y cuidarlo. La interpretación de las anotaciones, sin embargo, requiere el servicio de un técnico. La información obtenida por este método es similar a la que se logra por los métodos de informes corrientes, con la excepción de que las formaciones se anotan antes de que se les presente la oportunidad de contaminarse con el flúido de perforación.

Muestras con la presion original de formacion

A menudo los explotadores se equivocan al sacar muestras de formaciones incapaces de producir petróleo a causa de que el yacimiento se ha agotado, y no hay, por otra parte, manera alguna de calcular la relación de gas y petróleo en la formación examinando una muestra corriente.

Para sacar muestras a la superficie, que tengan las condiciones del depósito o yacimiento, la Carter Oil Co. desarrolló una sonda sacanúcleos que ofrece las ventajas siguientes: 1. Una determinación más cierta del contenido del yacimiento, que la suministrada por una sonda sacanú-

kelly is constructed to contain an electric cable which connects to a brush box mounted immediately below the swivel.

The electrical circuit for logging is established through the brush box to the bit by means of a section of cable inside a conduit brazed to the inside of the drill pipe. Electrical connection between joints is made by specially designed pairs of electric terminals integrally fixed and permanently mounted in the tool joints. When the tool joints are screwed together, the terminals engage and at the same time insulate the circuit from the mud stream.

The drill collar is specially constructed to insulate the bit from the drill pipe in order that the bit may serve as an electrode. A 10-ft. section of Bakelite immediately above the bit provides the necessary insulation. Bits used are of standard design.

The equipment is not complex and a drilling crew can easily be taught its operation and maintenance. Interpretation of the logs requires a technical man. Logs obtained by this method are similar to regular logs with the exception that the formations are logged before they have had a chance to be contaminated by the drilling fluid.

Obtaining Cores With Original Formation Pressure

Operators have often been misled by "bleeding" cores from formations that are incapable of producing oil because the reservoir is dead and there is no way of estimating the gas-oil ratio in the formation from a conventional core.

In order to bring cores having reservoir conditions to the surface, the Carter Oil Co. developed the pressure core barrel. Its purposes are: (1) A more certain determination of reservoir content than that furnished by a conventional core barrel; (2) location of gas caps and determination of content; (3) studies of oil, gas, and water gradients through a producing zone; (4) studies to determine proper well spacing; (5) studies of various methods and rates of production by working on cores under pressure; (6) studies of oil remaining in place in depleted fields; (7) studies of contamination of cores.

A valve at the bottom of the barrel shuts as the core barrel is lifted from bottom and is not opened until the core barrel reaches the laboratory. A valve can then be opened and the gas in the core is metered and the gas-oil ratio of the formation determined. In 13 tests it has been found that the gas-oil ratio of the core is within 10 per cent of the gas-oil ratio of the pool.

From the data obtained by analyzing a core obtained under pressure, it is more nearly possible to predict whether the well will flow naturally or will require some artificial lift, whether it will be a gas well or an oil well or whether it will be a dry hole. It is also possible to estimate more closely the ultimate production of the well.

The pressure core barrel now in use takes a core 8 ft. 6 in. long; a regular-type core cutter head is used with it. It has a slip joint at the top which goes into operation when the bottom plug is sheared. The core is then taken in the regular manner but, before the core barrel is picked up from bottom, the travel of the slip joint has closed the top and bottom valves on the chamber containing the core. This chamber can then be removed from the outer barrel as soon as it is brought from the hole, and taken to the laboratory.

Geochemical Prospecting and Logging

The rapid development of geochemical prospecting during the past 2 or 3 years has led to two interesting developments. The occurrence of hydrocarbons in the soil is now known to be almost universal, regardless of the oil content of the underlying rocks, so that the results of geochemical prospecting must be analyzed with greater care than was previously thought necessary. Chemical methods of analysis are giving way to physical methods, such as the use of mass-spectrograph. At the same time, there has arisen the realization that the theories on which geochemical prospecting is based must be reexamined. The percentage of successful operations based upon geochemical analysis is sufficiently low as to make it simply one of a number of methods of locating oil and in the same need of confirmation as the other methods.

The second development is based upon the theory that if hydrocarbons rise from an oil deposit, the rocks above that deposit should show signs of this migration, particularly in the presence of hydrocarbons in rocks overlying the pay. This has led to the development of geochemical logging. Cuttings and cores are subjected to analysis and hydrogen, methane, heavy hydrocarbons and other related substances are found. The reported results indicate that there is an increase of hydrocarbon content over the oil deposit and that edge wells are indicated by low concentrations. Also, there is reported a definite increase as the pay is approached, so that a high concentration indicates that the reservoir is not far below the level at which this concentration occurs.

This theory is quite different from the theory on which geochemical prospecting is based, in that the latter presupposes some sort of mineralization above the pay which causes the hydrocarbons to mushroom outward and form a halo of high concentration around the edge of the pool.

Mud Analysis

The theory on which mud analysis is based is that if the drill penecleos, de tipo corriente; 2. Posición de depósitos de gas y determinación de su contenido; 3. Estudios de gradientes de petróleo, gas y agua, en la zona productora; 4. Estudios para determinar la correcta separación de los pozos; 5. Estudios de varios métodos y régimenes de producción trabajando en muestras o núcleos bajo presión; 6. Estudios del petróleo que permanece en los campos agotados; 7. Estudios de la contaminación de las muestras o núcleos.

Una válvula, al fondo del sacanúcleos, se cierra al levantarse el sacanúcleos del fondo, y no se abre hasta que llega al laboratorio. La válvula se abre entonces aquí, y el gas en la muestra se mida y la relación de gas y petróleo de la formación se determina a continuación. En 13 ensayos, se ha visto que la relación de gas y petróleo de la mustra queda dentro de 10 por ciento de la relación de gas y petróleo existente en el yacimiento.

De los datos obtenidos del análisis del núcleo o muestra cortado bajo presión, es, en muchos casos, posible prededir si el pozo fluirá o emanará naturalmente o si requerirá algún levantamiento artificial, ya se trate de un pozo de gas o de un pozo de petróleo, o sencillamente un agujero seco. También es posible determinar de una manera más aproximada, la producción final del pozo.

El sacanúcleos ahora en uso saca núcleos o muestras de 8 piés 6 pulgadas de largo; se usa una cabeza cortadora de tipo corriente. Tiene una unión corrediza arriba, la cual entra en acción cuando se quita el tapón del fondo. El núcleo o muestra se toma de la manera de costumbre, pero antes de levantar del fondo el sacanúcleos, la carrera de la unión corrediza ha cerrado las válvulas de arriba y de abajo, en la cámara que contiene la muestra. Esta cámara podrá entonces quitarse del sacanúcleos exterior tan pronto como salga del agujero y en seguida llevarse al laboratorio.

Exploracion geoquimica e informe diario

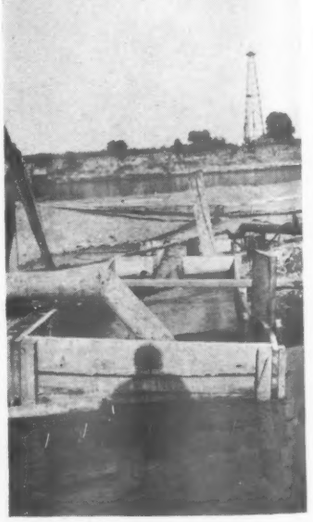
El rápido desarrollo de la exploración geoquímica durante estos últimos dos o tres años ha conducido a dos desarrollos interesantes. La presencia de hidrocarburos en el suelo es ahora aceptada como algo casi universal, independientemente del contenido de petróleo de las rocas subterráneas, de modo que los resultados de la exploración geoquímica deben analizarse con mayor cuidado que el que se creía necesario en años pasados. Los métodos químicos de análisis están cediendo su lugar a los métodos físicos, tales como el uso del espectrógrafo de masa. Al mismo tiempo, se ha presentado la realización de que las teorías sobre las cuales se basa la exploración geoquímica, debe examinarse de nuevo. El porcentaje de operaciones satisfactorias basadas sobre el análisis geoquímico es bastante bajo para hacerlo sencillamente uno de los varios métodos de descubrir petróleo, y con la misma necesidad de confirmación que los otros métodos existentes.

El segundo desarrollo está basado sobre la teoría de que si los hidrocarburos se levantan de un depósito o yacimiento de petróleo, las rocas, encima de este yacimiento, deberían mostrar indicios de esta presencia, particularmente en vista de los hidrocarburos en las rocas que hay encima de la paga. Esto ha conducido al desarrollo del informe geoquímico de la perforación. Los deshechos y núcleos o muestras se someten a análisis y se descubren hidrógeno, metano, hidrocarburos pesados y otras substancias afines. Los resultados obtenidos indican que hay un aumento de contenido de hidrocarburos encima del depósito de petróleo y que los pozos al borde se indican por bajas concentraciones. También se indica un aumento definido, a medida que se aproxima el yacimiento de paga, de modo que una gran concentración indica que el depósito no está muy por debajo del nivel a que ocurre esta concentración.

Esta teoría es bastante diferente de la teoría en que se basa la exploración geoquímica, pues en esta última se presupone cierta mineralización arriba del yacimiento de paga, que hace que los hidrocarburos se esparzan hacia afuera formando un círculo de gran concentración alrededor de los bordes del depósito o yacimiento.

Analisis del barro

La teoría en que se basa el análisis del barro es que si la sonda penetra un yacimiento o formación que tenga petróleo, gas o agua salada, trazas de estas substancias deberán aparecer en el barro. El análisis del barro se ha hecho así un método suplementario al informe eléctrico y al análisis de núcleos o muestras, pues trata de indicar exactamente la posición de las formaciones produc-



Boards used for mud pits while drilling in sand bar of a river

Tablas usadas en los pozos de lodo mientras se perfora en punto arenoso de un rio

trates a formation which shows oil, gas or salt water, traces of these substances should show up in the mud. Mud analysis thus becomes a method supplementary to electric logging and core analysis in that it attempts to locate exactly the productive formations. Gas is detected by means of a sensitive hot-wire detector which will read as low as 1 cu. in. of gas per hour if desired. Oil is detected by means of ultraviolet light and water by noting differences in the resistances of ingoing and outcoming mud.

Logging by Radioactivity

A method of logging which claims no ability to detect the presence of fluids in the rock but which claims to be able to correlate formations more accurately than any other method is radioactive, or gamma ray, logging. The theory upon which this method is based is the well-established one that all rocks are radioactive and that this radioactivity has a wide horizontal and a narrow vertical range. Thus, by noting high and low gamma ray emanations, it is possible to construct a profile which superficially resembles an electric log but which locates formation tops and minute variations with extreme accuracy.

Gamma ray emanations are capable of penetrating only 7 in. of rock so that readings locate tops within a few inches. At the same time, the gamma rays can penetrate casing and old wells can be surveyed by this method in order to pick up sands which were originally cased off but which are now known to be productive. The method is particularly adaptable to areas such as Seminole where the wells were so crooked that productive sands above the Wilcox often cannot be located within 100 ft. of their position in the well by subsurface geology.

toras. El gas se descubre mediante un detector de alambre caliente muy sensitivo, que puede leer hasta un mínimo de 1 pulgada cúbica de gas por hora, si se desea. El aceite se descubre por medio de una luz ultravioleta y agua, observando las diferencias en resistencia del barro entrante y del barro que sale.

Informe de perforacion por radioactividad

Un método de informe de perforación, que no pretende tener ninguna facultad para averiguar la presencia de flúidos en la roca, pero que asegura poder correlacionar las formaciones con más exactitud que todo otro método, es el de informe radioactivo o de rayo gamma. La teoría sobre la cual se funda este método es la ya bien establecida de que todas las rocas son radioactivas y que esta radioactividad tiene un amplio horizonte y una estrecha extensión vertical. De este modo, observando las emanaciones altas y bajas de rayos gamma, es posible construir un perfil que superficialmente se parece a un informe eléctrico, pero que señala las cimas de las formaciones y las pequeñas variaciones con extrema exactitud.

Las emanaciones de rayos gamma son capaces de penetrar sólo 7 pulgadas de roca, de modo que las lecturas indican las cimas dentro de pocas pulgadas. Al mismo tiempo, los rayos gamma pueden penetrar la tubería y los pozos antiguos pueden estuiarse por este método para levantar arenas que originalmente tapadas y que ahora se sabe que son productivas. Este método es particularmente aceptable en regiones como en Seminole donde los pozos son tan torcidos que las arenas productivas arriba del Wilcox a menudo no pueden indicarse dentro de 100 piés de su correcta posición en el pozo por geología subterránea.

Progress in Drilling
Progreso en Perforacion

ATTENTION throughout the past year has been directed more toward the improvement in practices and equipment than toward the introduction of revolutionary ideas or machinery. No wells were drilled which exceeded the present record depth of 15,004 ft. but there were steady advances in deep drilling technique due to the ever-increasing number of deep fields in the Gulf Coast and California areas.

Greatest attention was being paid to reducing the cost of drilling through more efficient operation; experimentation and research continued in an effort to increase the footage per bit, and the footage for overall drilling time of the rig. Various methods have been introduced in an effort to obtain longer life from tool joints. Studies of drilling mud have been directed toward producing a fluid which will more assuredly protect the hole and at the same time increase the rate of penetration; the principal economy is the reduction in the number of strings of casing necessary by increasing the amount of open hole which can be safely carried. Methods of exploiting multiple zones in a single well bore have been improved.

Most of the developments in the field have been the result of painstaking research in the laboratories and the application of ideas discussed at the technical association meetings. Executive departments have been encouraging engineers to develop methods and processes which will increase the reserves of company by decreasing the drilling costs.

Drilling Time and Bit Performance

In practically all fields of any depth, drilling-time data are being gathered either by mechanical means or by a record of the essential data kept in a log book. The rate of penetration is recorded by a device which operates a time chart on which the height of the top of the kelly joint is plotted. In some cases, fluid pressure regulates the position of the stylus and in others it is operated by a chain. Rate of penetration is recorded in feet per minute.

Rate of penetration in itself is not enough but in addition the rotary speed, weight on bit, pump speed, pump pressure, mud weight and viscosity and size of water courses in bits must also be known. Recording tachometers, revolution counters and visual counting of the revolutions are used, with the first being the most accurate and hence the one preferred where detailed information is wanted. Recording weight indicators have long been on the market and recording pump pressure gages have been used in many instances.

While the pump pressure is important, the strokes per minute of the pump is equally vital as it determines the gallons per minute delivered to the bit. Stroke counters

LA atención, durante todo el año pasado, se ha dirigido más hacia el perfeccionamiento de prácticas y equipos, que hacia la introducción de ideas o maquinaria de caracter revolucionario. De los pozos perforados, ninguno sobrepasó en profundidad al de 15.004 piés existente desde hace tiempo, pero, al mismo tiempo, se presenció progreso en la técnica de perforar pozos profundos, debido al creciente número de yacimientos a gran profundidad en las regiones de la Costa del Golfo y California.

Se prestó especial atención a la reducción del costo de la perforación, gracias a métodos más eficaces. Continuó el trabajo de experimento y estudio, para aumentar el metraje por broca y el metraje total, en determinado tiempo, de trabajo de torre. Se han introducido varios métodos, a fin de prolongar la duración de las uniones o acoplamientos de las herramientas. Los estudios del barro de perforación se han dirigido hacia la producción de un flúido que pueda dar protección al agujero con mayor seguridad y aumentar, al mismo tiempo, la velocidad de la penetración. La principal economía está en la reducción de series de tubería necesarias, aumentando la cantidad de agujero abierto que puede llevarse con seguridad. Los métodos de explotar zonas múltiples en un solo agujero abierto se han perfeccionado.

Casi todos los desarrollos en el campo han sido el resultado de minuciosos estudios en los laboratorios y la aplicación de ideas discutidas en las reuniones de asociaciones técnicas. Los departamentos administrativos han estimulado a los ingenieros para que desarrollen métodos y procedimientos que vengan a aumentar las reservas de las compañías mediante la reducción de los costos de la perforación.

Tiempo de perforación y funcionamiento de la barrena

En casi todos los campos de cualquiera profundidad, se está recopilando información sobre el tiempo de perforación, valiéndose de medios mecánicos o por medio de los datos esenciales obtenidos del informe diario de perforación. La velocidad de la penetración se registra por un dispositivo que actúa sobre una tabla cronológica, en la cual se traza la altura del tope de la unión del kelly. El algunos casos, la presión del flúido regula la posición del punzón indicador, y en otros, queda accionado por una cadena. La velocidad de la penetración queda registrada en piés por minuto.

El régimen o velocidad de penetración, por si misma, no es suficiente. Es necesario conocer también la velocidad giratoria, el peso sobre la barrena, la velocidad de la bomba, la presión de la bomba, peso y viscosidad del barro y tamaño de los chorros de agua en la barrena. Los contadores registradores de veloci-

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USED THROUGHOUT THE WORLD FOR EVERY STEP IN DRILLING

BAROID is a drilling mud weighting material of high specific gravity manufactured from barytes, or native barium sulphate, ground and processed especially for oil well use. Added to drilling mud, BAROID helps control gas, oil, water or formation pressures and aids in maintaining the walls of the open hole. Only a small amount of colloidal material is required to keep BAROID from settling and to hold it in suspension indefinitely. It is chemically inert, non-abrasive and non-corrosive, and fewer tools are stuck when BAROID is used.

BAROID es un material para aumentar el peso del lodo de perforación, de alto peso específico, que se hace de baritas o sulfato de bario natural, bien molido y preparado especialmente para uso en pozo de petróleo. Añadido al lodo de perforar, BAROID ayuda a gobernar el gas, petróleo, agua o presiones de la formación, y sirve también para la mantención de las paredes del agujero abierto. Se requiere sólo una pequeña cantidad de material coloidal para impedir que el BAROID se precipite y para mantenerlo indefinidamente en suspensión. Es químicamente inactivo, no es raspante ni corrosivo. Cuando se usa BAROID hay menos atascamiento de herramientas.

COLOX is a mud-weighting material composed chiefly of amorphous iron oxide. Its specific gravity makes possible drilling muds of a density as high as 20 pounds per gallon (150 pounds per cubic foot or a specific gravity of 2.4). COLOX is used to help control gas, oil, water or formation pressures and to aid in preventing caving.

COLOX es un material para aumentar el peso del lodo y se compone principalmente de óxido de hierro amorfo. Su peso específico permite el uso de lodos de perforar de un peso o densidad hasta de 20 libras por galón (150 libras por pié cúbico, peso específico de 2.4). COLOX se usa para ayudar a gobernar el gas, petróleo, agua o presiones de formación, y también para ayudar a evitar el derrumbe.

AQUAGEL is a gel-forming, colloidal drilling clay made of carefully selected and processed bentonites. AQUAGEL muds deposit only a thin, easily-removable cake on the walls of the hole and allow only a small amount of water to penetrate the formation. Because of these advantages, AQUAGEL muds promote faster drilling and earlier completions due to freedom from caving and stuck drill pipe, and augmented production because of the absence of a large amount of water from the drilling mud in potential producing zones.

AQUAGEL es una greda coloidal de perforación, formadora de gelatina, hecha de bentonitas cuidadosamente elegidas y preparadas. Los lodos tratados con AQUAGEL depositan sólo una delgada capa de fácil remoción sobre las paredes del agujero y permiten la penetración de sólo una pequeña cantidad de agua en la formación. Debido a estas ventajas, los lodos tratados con AQUAGEL aceleran la perforación y la terminación del agujero, evitando el derrumbe y la detención o atascamiento del tubo de perforación. Se aumenta así la producción, debido a la ausencia de una gran cantidad de agua del lodo de perforación, en las zonas de producción potencial.

STABILITE is a superior chemical mud thinner used to reduce the viscosity and gel strength of thick drilling fluids, enhancing their wall-building properties and facilitating the release of entrained gas. STABILITE is superior to other chemicals commonly used in that its viscosity reduction is greater and its effects longer lasting and not so subject to the dissipating effects of elevated temperatures.

STABILITE es una excelente substancia química para reducir la viscosidad y fuerza gelatinosa de los espesos líquidos de perforación, y al mismo tiempo, para acentuar sus propiedades de retención de pared y libertar el gas tapado. STABILITE es superior a otras substancias químicas de uso corriente, a causa de que su reducción de viscosidad es mayor y sus efectos más durables, sin quedar sujetos a los efectos disipantes de las altas temperaturas.

BAROID PRODUCTS

BAROID and COLOX: Drilling Mud Weighting Materials.
AQUAGEL: Gel-Forming Colloidal Drilling Clay.
FIBROTEX: A Fibrous Material for Regaining or Preventing the Loss of Circulation.
BAROCO: A Salt-Water-Resisting Drilling Clay.
STABILITE: A Superior Chemical Mud Thinner.
AQUAGEL-CEMENT: Material for Recovering Lost Circulation and Cementing Casing.
SMENTOX: Material for Counteracting the Effects of Cement Contamination and for Reconditioning Cement-Cut Mud.
ZEOGEL: A Special Clay to be Used as a Suspending Agent When High Concentrations of Salt or Salt Water Are Encountered.
MICA: A Material for Reducing Water Loss to the Formation and for Overcoming Mild Cases of Lost Circulation.
TESTING EQUIPMENT: Apparatus for Making Complete Field and Laboratory Examination of the Properties of Drilling Mud.
SERVICES: DRILLING MUD ANALYSIS and CONTROL: Baroid Service Engineers and their laboratory-equipped cars are available in all active oil fields of the U. S. These engineers are trained and experienced in analyzing and correcting mud troubles.
BAROID WELL LOGGING SERVICE: Formation Information Through Mud Analysis.

PRODUCTOS BAROID

BAROID y COLOX: Materiales para aumentar el peso de los lodos de perforación.
AQUAGEL: Greda coloidal de perforación, formadora de gelatina.
FIBROTEX: Un material fibroso para recuperar o impedir la pérdida de circulación.
BAROCO: Greda de perforación resistente al agua salada.
STABILITE: Un perfeccionado producto químico para diluir el lodo.
AQUAGEL-CEMENT: Material para recuperar la circulación pérdida y para cementar revestimiento a tubería.
SMENTOX: Material para contrarrestar los efectos de la contaminación del cemento y para rehabilitar el lodo mezclado con cemento.
ZEOGEL: Una greda especial, que se usa como agente de suspensión cuando se presentan grandes concentraciones de sal o agua salada.
MICA: Un material para reducir la pérdida de agua, que va a la formación y para curar los leves casos de pérdida de circulación.
EQUIPO DE ENSAYO: Aparatos para hacer ensayos completos en el campo, y estudios o examenes de laboratorio, de las propiedades del lodo de perforación.
SERVICIOS: ANALISIS Y GOBIERNO DEL LODO DE PERFORACION: Los ingenieros del Servicio Baroid y sus laboratorios instalados en automóviles, están a la disposición de los interesados en todos los activos campos petrolíferos de los Estados Unidos de América. Estos ingenieros tienen muchos conocimientos y experiencia práctica en el análisis y la corrección de problemas de lodos de perforación.
SERVICIO BAROID DE INFORME DAIRIO DE PERFORACION DE POZOS: Información sobre la formación o yacimiento, mediante análisis del lodo.

BAROID SALES DIVISION

National Lead Company

BAROID SALES OFFICES: LOS ANGELES · TULSA · HOUSTON

TRADE MARK
BAROID
OIL WELL DRILLING MUD SERVICE

Baroid Products and Se
Engineers are available
active oil fields of the U

have been used in isolated instances but it is not the general practice, and, while continuous mud samplers are being used, devices for automatically recording weight and viscosity are not in general use although recently there was introduced a machine for making a continuous record of the mud weight.

In analyzing bit operation and performance, consideration must be given to the fact that the drilling rate for any bit diminishes as the bit wears and this factor is dependent on the formations penetrated. The skill of the driller will greatly determine the condition of the bits when they are withdrawn from the hole but this is no indication that the bit was replaced at the proper time.

When uniform formations are being drilled it can be demonstrated, according to Yeatman, that the bit should be renewed when

$$R = \frac{E}{\frac{C + D + F}{K}}$$

where

R = rate of penetration in feet per hour.
E = total footage drilled by the bit.
C = cost of the bit in dollars.
K = cost of rig operation in dollars per hour.
D = round-trip time in hours.
F = drilling time on bottom in hours

When the performance of a given bit is plotted as hours on bottom against feet drilled, the time at which economy is served best by bit renewal is portrayed graphically as that point on the plotted curve at which the tangent equals the expression

$$\frac{E}{\frac{C + D + F}{K}}$$

When using graphic analysis, the value of $\frac{C}{K}$ becomes the bit factor.

In some cases the replacement of a bit results in only a slight increase in the rate of penetration and the increase in the cutting rate anticipated should affect the decision of whether or not to change the bit. In some fields, bits are pulled which could make much more hole and their replacement results in only a slight change in the cutting speed. In such cases it is not a matter of the most economical cutting speed but the maximum cutting speed to be expected from a bit.

Comparison of bit performance and the development of the bit sequence resulted in a material reduction in the cost of drilling in the Louden, Illinois, field. By tabulating the footage made, footage per hour, hours run and depths at which bit was run and pulled a sequence was developed which substantially lowered the number of bits used and also lowered the time required to drill a well. The information was gathered over a long period and included a large number of each type bit.

Further study of the data developed a definite relationship between the bit footage and the drilling rate and enabled the operator to reduce the penetration cost per foot (bit cost per foot plus penetration costs per foot) to a minimum. By plotting the footage per bit and the footage per hour it is possible to arrive at the maximum and minimum economic values for each factor.

The varying effects of both footage and drilling rate on the total penetration rate are thus shown with the rate relationship so oriented that its intersection with the former is located at their common minimum total cost. Their intercept when projected to the abscissa establishes the well average. An arbitrary economic limit was selected for the two factors.

A nomograph, prepared for use of the drillers in furtherance of the plan, aided in determining the average penetration rate for a bit at any depth by simply knowing the number of hours it had been on bottom.

Connecting Tandem Drill Collars

The wide adoption of tandem drill collars has been impeded by the difficulty of getting over these pieces with an overshot in cases of a twist-off. Increase in the thickness of the metal in the bottom of the drill string results in a concentration of the shocks on the connections and the connection threads. In case of breaks the fish may have to be recovered with a tapered tap and this is often difficult.

Some companies are using the connection submitted to the A.P.I. which permits the use of a larger drill collar as the failure is almost certain to occur at a point where a small diameter of the drill stem will provide enough clearance for the use of an overshot. Other contractors and companies are using a slightly smaller drill collar which has enough clearance to allow use of the regular overshot. In such cases the drill collar sections are connected with a double-pin sub.

Bit Selection

During the past several years the metallurgy and the construction of rock bits have been improved but more noteworthy is the increase in the number of types of cutters available to the driller. This in turn throws a greater responsibility on the driller as the wrong selection would result in both the loss of time and the waste of a bit.

Teeth on the cutters now vary from the very long feather-edged type to the short, blunt type with all graduations between. For soft formations the long teeth with a definite cutting action are the most suitable while for hard formations short teeth which will grind and pulverize

(Continued on Page 183)

dad, los contadores de revoluciones y la cuenta visual de las revoluciones, se emplean en el trabajo, siendo los primeros los más exactos y los preferibles cuando se desea tener información bien detallada. Los indicadores registradores de peso han estado en el mercado desde hace tiempo, y los manómetros registradores de presión de bomba se han usado en muchos casos.

A pesar de que es importante la presión de la bomba, las carreras por minuto de la bomba son igualmente importantes, pues determinan los galones por minuto que van a la barrena. En casos aislados se han usado contadores de carreras de bomba, pero este método no ha llegado todavía a generalizarse en la industria. Mientras se han usado tomadores contínuos de muestras de barro, todavía no se ha hecho general el uso de dispositivos para registrar automaticamente el peso y la viscosidad, a pesar de la reciente introducción de una máquina para llegar registro contínuo del peso del barro.

En el análisis de la operación y funcionamiento de la barrena, es necesario dar consideración al hecho de que velocidad de perforación, para cada barrena, se reduce con el mismo desgaste de la barrena, y este factor depende de las formaciones que se penetran. La habilidad del perforador decidirá grandemente la condición de las barrenas cuando salen del agujero, pero esto no es indicación de que la barrena haya sido reemplazada a debido tiempo.

Cuando se perforan formaciones uniforme, se puede demostrar, según declara Yeatman, que la barrena debe renovarse cuando

$$R = \frac{E}{\frac{C + D + F}{K}}$$

El la presente fórmula, R significa la velocidad de la penetración en piés por hora.

E significa la cantidad total de piés perforados por la barrena.

C significa el costo de la barrena en dólares.

K significa el costo en dólares de la operación de la torre, por hora.

D significa el tiempo en horas del viaje redondo.

F significa el tiempo de perforación, en horas, en el fondo.

Cuando se traza el funcionamiento de una barrena dada sobre la base de horas en el fondo contra piés perforados, el tiempo en que resulta más economía mediante la renovación de la barrena, queda gráficamente indicado en el punto de la curva trazada en que la tangente iguala a la expresión

$$\frac{E}{\frac{C + D + F}{K}}$$

Cuando se usa el análisis gráfico, el valor de $\frac{C}{K}$ se convierte en el factor de la barrena.

En algunos casos, la renovación de la barrena resulta sólo en un leve aumento en velocidad de penetración, y el aumento en la velocidad de corte anticipado debería afectar la decisión de cambiar o no la barrena. En algunos campos, se quitan las barrenas que podrían todavía más agujero, y su renovación resulta en sólo un leve cambio de velocidad de corte. En semejantes casos, no es asunto de la velocidad de corte más económica, sino de la velocidad máxima de corte que puede esperarse de una barrena.

La comparación del funcionamiento de la barrena con el desarrollo de una secuencia de barrena, resultó en una considerable reducción en el costo de la perforación en el campo de Louden, Illinois. Tabulando el total de piés perforado, el total de piés por hora, horas de trabajo y profundidades alcanzadas por la barrena, se desarrolló una secuencia, que sirvió para reducir bastante el número de barrenas usadas y también para reducir el tiempo requerido para perforar un pozo. La información fué recopilada durante un largo período de tiempo e incluyó un gran número de cada tipo de barrena.

El adicional estudio de los datos desarrolló una relación definida entre el total en piés y la velocidad de la perforación y permitió el costo de la penetración por pié (costo de la barrena por plé y costo de la penetración por pié) a un mínimo. Trazando el total en piés por barrena y el total en piés por hora, se puede llegar a los valores económicos máximo y mínimo de cada factor.

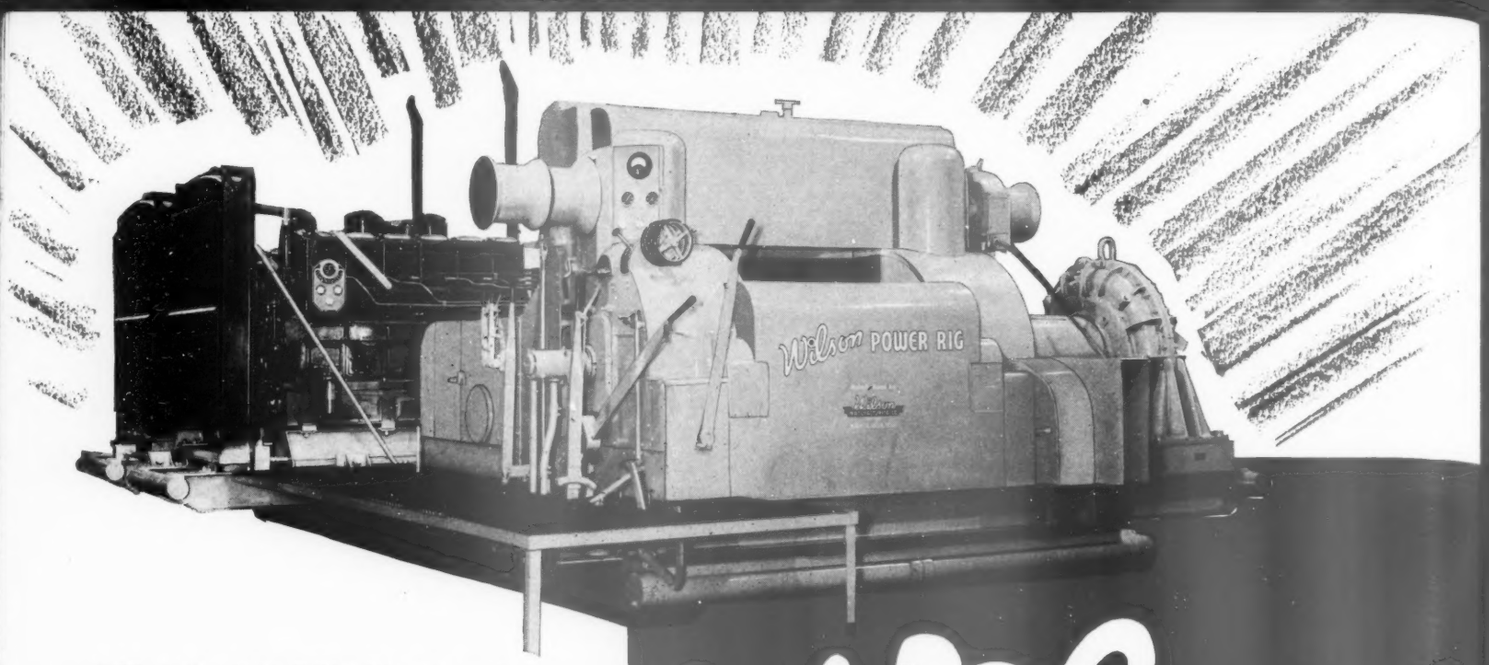
Los variables efectos del total en piés de la barrena y de la velocidad de la perforación, sobre la velocidad total de la penetración, quedan así indicados con una relación entre ambos factores orientada de tal modo que su intersección con los primeros viene a fijarse en su común costo total mínimo. Proyectada la línea interceptora hasta la abcisa, establecerá el promedio del pozo.

Un nomógrafo, preparado para el uso de perforadores, para promover el plan, ayudó a determinar la velocidad promedia de la penetración de la barrena, a cualquier profundidad, nada más que sabiendo el número de horas que había estado en el fondo.

Conexión de collares de perforación en tándem

La amplia aceptación de los collares de perforación en tándem ha sido impedida por la dificultad en poder pasar estas piezas con enchufes "Overshot" en casos de un ladeamiento. El aumento en el espesor del metal en el fondo de la serie de herramientas de perforación resulta en una concentración de choques en las conexiones y las roscas de las

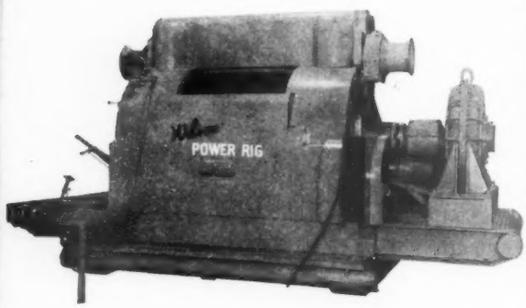
(Continue en Pagina 183)



Wilson

● Wilson Atlas Model Drilling Rig rated capacity 8,000 ft. using 4½" drill pipe. This rig is shown equipped with Cummins Diesel Engines, and is in operation at present time on a 6,500 foot wildcat in Canada. Can be furnished with either 500 H.P. or 700 H.P. chain transmission. The rotary friction clutch along with the pump friction clutch and the air controls on the drum clutches and chain transmission all combine to make this one of the fastest rigs in operation today.

● Aparejo de perforación Wilson, modelo Atlas, con capacidad nominal de 8000 pies usando tubo de perforación de 4¼". Este aparejo se muestra aquí provisto de motores Cummins de tipo Diésel, y está funcionando en un pozo de 6500 piés en el Canadá. Puede suministrarse con transmisión de cadena de 500 o de 700 cdf. El embrague de fricción giratorio, en combinación con el embrague de fricción de la bomba y los gobiernos neumáticos de los embragues de los tambores y transmisión por cadena, hacen que el presente aparejo de perforación sea uno de los más rápidos del mercado.



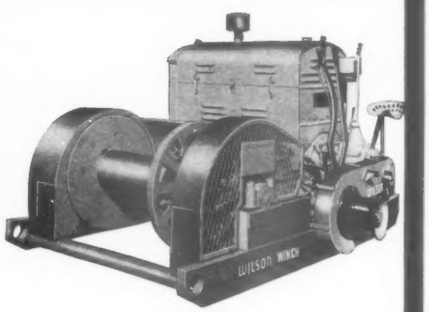
● The Wilson Titan Model Drilling Rig holds the World's Record for Internal Combustion Engine Powered Mechanical Rigs. This rig is regularly equipped with all features listed in column two, including water cooled friction clutches in the drum, both high and low speeds, and these clutches have demonstrated their ability to drill to any depth now possible with present drill pipe. Unquestionably the finest piece of drilling equipment ever built. (Note guard removed to show clutch and coupling for Hydromatic Brake.)

● Aparejo de perforación Wilson, modelo Titan, tiene el record mundial para aparejos de perforación mecánica accionados por motor de combustión interna. Este aparejo se equipa normalmente con todos los rasgos que anotados en la segunda columna, incluyendo embragues de fricción de enfriamiento por agua en el tambor, de alta y de baja velocidad. Estos embragues han comprobado su utilidad para peforar a cualquiera profundidad ahora posible con el presente tubo de perforación. Sin duda alguna, el mejor equipo de perforación del mercado. (Tome nota que el resguardo se ha quitado para mostrar el embrague y acoplamiento para freno Hydromatic).

Exclusive Features of Wilson Power Rigs—

1. Flame Hardened, Ground and Polished Alloy steel Brake Rings—File hard!
2. Dynamically Balanced Drum and other Rotating parts.
3. Instrument Panel including tachometers showing RPM of Engines, Pump and Rotary Table; instruments showing engine condition, and proper compounding; air pressure gauges and ignition switches; all with sliding door cover.
4. Cathead Safety Device to protect Operator.
5. Cradle Mounted Hydromatic Brake with instant engaging clutch lever controlled from Driller's Position.
6. Clamp-On-Cover Oil Tite Chain Guards. On or off in one minute!
7. Rubber Cushion mounted Shock Absorbing Chain Transmission.
8. Rubber Cushion Shock Absorbing Engine Clutches.
9. Full Circulating Water Cooled Friction Clutches in drum; same system cooling both brakes and clutches.
10. Friction Latch on Brake Lever; perfect feeding without automatic feed control unit.
11. Air controlled Transmission with "speed lock," which prevents shifting at speeds that would damage transmission.
12. High and Low Speed Friction Drum Clutches; with Finger Tip Air Controls; and Manual Emergency Control.

Wilson Sets the Pace!

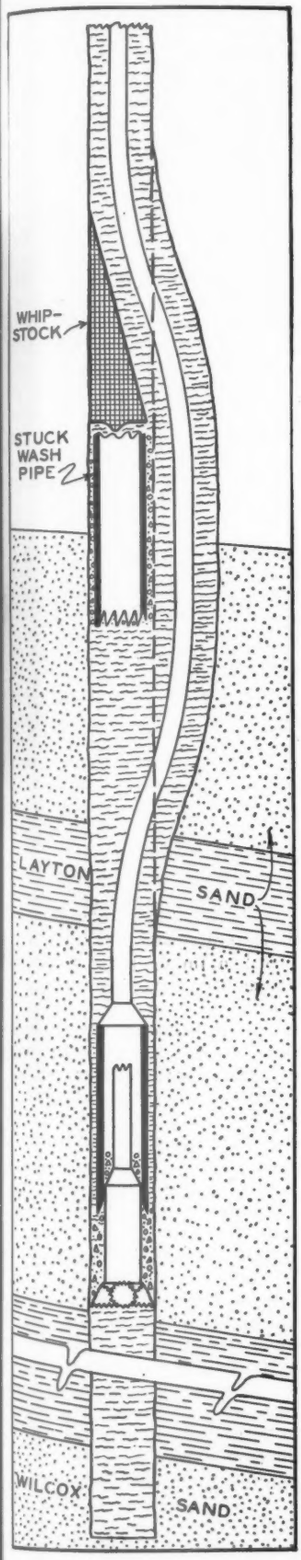


● Wilson Super Model Single Drum Winch showing new streamlined guards. Furnished with either Friction or Jaw Clutches in drum. Rated capacity, 4,000 to 5,000 ft. wells. This type machine is built in seven sizes, suitable for use on 2,000, 3,000, 4,000, 5,000, 6,000, 8,000, and 10,000 ft. wells. The most popular of all types of oil field winches, this machine is recognized as the strongest and most reliable of all machines in its class.

● Montacargas o torno Wilson, modelo Super, de un solo tambor, con resguardos de estilo perfilado. Se suministra con embragues de fricción o de mandíbula, en el tambor. Capacidad nominal, de 4000 a 5000 piés. Este tipo de máquina se ofrece en siete tamaños, adaptados a uso en pozos de 2000, 3000, 5000, 6000, 8000 y 10.000 piés. Es la máquina de tipo más popular en los campos de petróleo, y el presente modelo se acepta como el más firme y seguro de su clase.

(Continued from Page 179)

the rock give the best service. In areas where there is a considerable thickness of soft formations, fish-tail and drag bits continue to be used because of their high rate of penetration and their low costs. These bits are constantly being improved in both design and material and many types of hard facing are successfully used on the cutting surfaces.



Method for sidetracking 72 ft. of wash-over string in order to get a hold on and recover the fish below

Método de perforación desviada, aplicado a una tubería de 72 piés, de lavar, para sujetar y recuperar la herramienta de abajo

Study of Tool-Joint Wear

The fact is recognized that tool-joint wear does not vary directly with the footage drilled since clearance between tool joint and wall of the hole increases as the metal is worn away. However, the wear per 1,000 ft. of hole can be used to compare tool-joint service over any particular period.

Outside-diameter wear often varies between different strings in the same field due to difference in hole sizes, mud characteristics, formation, weight and rotating speeds and metallurgy of the joints. The wear of the joints is determined by measuring the circumference at the faces, middle and backs of the tool joints selected from the string. Generally the measurements are taken at the end of each well.

Various means of controlling outside-diameter wear are employed, including hardfacing materials, oversized joints, and rebuilt joints. The effectiveness of each must be determined on a cost-per-foot basis.

Tool-joint face and thread maintenance is imperative for long life and in some localities this is the prominent problem that can be controlled by rigid inspection and service. Tool-joint design affects this problem and education of the drilling crews in the proper care of the joint is also imperative.

Hole Sizes and Slim-Hole Drilling

During the past 10 years the drilling rate has been speeded up by approximately 500 per cent through the increase of time spent on bottom in relation to overall time of the operation, introduction of better materials, more careful planning of the hole, and decreasing the hole sizes. However, this latter factor seems to have reached the minimum within economic limits.

The only reason for resorting to a small hole is the saving in money and at the present time operators are looking beyond the immediate investment to operating efficiency throughout the life of the well. The size of the hole is also limited by the type and slope of formations to be encountered, a very small hole being much more difficult to drill vertically than a medium-size hole. Drill-collar clearances must be small or a sacrifice in weight at the bottom of the string must be made. While the tensile strength of the smaller sizes of drill pipe is sufficient for ordinary drilling, it is also likely to fracture as a result of stall shocks at high speeds.

The term "slim hole" is rather loosely applied and its interpretation varies with the locality. In some cases it refers to the type of

(Continue desde Pagina 179)

conexiones. En caso de rotura, la herramienta perdida tendrá que recuperarse con un macho aterrajado, lo cual, a menudo, es muy difícil.

Algunas compañías están usando la conexión sometida a la A.P.I., la cual permite el uso de un collar de perforación más grande, pues la falta es casi seguro que ocurrirá en un punto donde un diámetro pequeño de vástago de sonda provee amplio espacio para un enchufe "Overshot." Otros contratistas y compañías están usando una conexión de perforación levemente menor, que tiene suficiente espacio para permitir el uso del enchufe regular. En semejantes casos, las secciones del collar de perforación están conectadas con una unión doble especial.

Selección de barrena

Durante estos últimos años, la metalurgia y la construcción de barrenas de roca se han mejorado, pero más notable ha sido el número de tipos de cortadores que a su disposición han tenido los perforadores. Esto, por su parte, impone una mayor responsabilidad sobre el perforador, a causa de que la selección incorrecta podrá resultarle en pérdida de tiempo y desperdicio de herramienta.

Los dientes de los cortadores varían del tipo de borde bien largo y agudo al tipo corte y sin filo, incluyéndose entre ellos todas las graduaciones. Para formaciones blandas, el tipo de diente largo tiene una acción bien definida, mientras que para las formaciones duras, el tipo de diente corto, con una acción de raspadura y pulverización, da los mejores resultados.

En zonas donde hay un considerable espesor de formaciones blandas, las barrenas de cola de pescado y las barrenas de fricción continúan usándose debido a su gran velocidad de penetración y bajo costo. Estas barrenas se están mejorando continuamente en tipo y material, y muchos tipos de revestimientos duros se emplean en sus superficies cortantes.

Estudio del desgaste de las uniones para tubería de perforación

Se reconoce el hecho de que el desgaste de las uniones para tubería de perforación no varía en relación directa con la cantidad de piés perforada, a causa de que el espacio entre la unión y la pared del agujero aumenta con el desgaste del metal. Sin embargo, el desgaste por 1000 piés de agujero puede usarse para comparar el servicio de las uniones para tubería de perforación durante cualquier período que se quiera.

El desgaste del diámetro exterior a menudo varía entre diferentes series en el mismo campo, debido a diferencia en los tamaños del agujero, características del barro, formación, peso y velocidades de rotación, y metalurgia de las uniones. El desgaste de las uniones se determina midiendo la circunferencia de las caras, mitad y respaldos de las uniones elegidas de la serie. Generalmente, las medidas se toman al fin de cada pozo.

Se emplean varios medios para gobernar el desgaste del diámetro exterior, incluyendo materiales de revestimiento, uniones de sobretamaño y uniones reconstruídas. La efectividad de cada uno se determina sobre la base de costo por pié.

La conservación de la cara y rosca de las uniones para tubería de perforación es esencial para su prolongada duración y en algunos puntos, constituye el problema más prominente, que sólo puede gobernarse mediante rígida inspección. La construcción o tipo de las uniones afecta al problema, y al mismo tiempo es necesario instruir a la cuadrilla de trabajadores, en el correcto cuidado de estas piezas.

Tamaños de agujeros y perforación de agujero pequeño

Durante los últimos 10 años, la velocidad de perforación se ha aumentado como 500 por ciento, gracias al mayor tiempo invertido en el fondo, en relación con el tiempo total de la operación, introducción de mejores materiales, estudio más cuidadoso del agujero y reducción de los tamaños de los agujeros. Este último factor, sin embargo, parece que ha llegado a lo mínimo dentro de los límites económicos.

La única razón para recurrir al agujero pequeño es el ahorro de dinero, y al presente, los explotadores están mirando más allá de la inversión inmediata, para asegurar una operación eficaz durante toda la vida del pozo. El tamaño del agujero está limitado también por el tipo y la inclinación de las formaciones que se presentan y se ve que un agujero muy pequeño es mucho más difícil de perforar, en sentido vertical, que un agujero de tamaño mediano. Los espacios de los collares de perforación deben ser pequeños, o bien, habrá que sacrificar parte del peso al fondo de la serie de herramientas. A pesar de que la resistencia a la tracción de los tubos de perforación de diámetros más pequeños es suficiente para la perforación ordinaria, existe, al mismo tiempo, la posibilidad de fractura, como resultado de los choques de súbitas paradas en las altas velocidades.

La designación de "agujero pequeño" es un tanto vaga, pues su interpretación varía con la localidad. En algunos casos se refiere al tipo de máquina usada, en otros, a un agujero más pequeño que el ordinariamente perforado en una zona determinada. Para algunos connota el agujero más pequeño, mediante el cual pueda hacerse producir un pozo.

Esta práctica puede seguirse con seguridad donde no se anticipe una mayor profundización posterior del agujero y donde la explotación del pozo quede racionalmente independi-

machine used to drill; in other cases its means a hole smaller than ordinarily drilled in that particular area. To some it definitely connotes the smallest hole through which a well could be brought to production.

This practice can be safely followed where no later deepening of the well is anticipated and where the operation of the well will be reasonably free from difficulties. If large volumes of water will later have to be handled, the engineer will be severely handicapped in installing equipment to overcome the difficulty. In case the well must be recompleted later for any reason the difficulties associated with slim holes will increase because of the necessity of using small drilling tools inside the small pipe.

Many operators prefer to drill a slightly larger hole and run larger casing with the expectation that the extra investment will be liquidated by increased operating efficiency. The casing size in any hole may be increased by eliminating the collars on screw-type casing through the use of welded casing. Following is a table of hole sizes, drill pipe, and casing used in one area.

Diameter of hole drilled below surface pipe (in.)	Size of drill pipe (in.)	Size of casing set (in.)
11	6⅝	8¼ o.d.
9⅞ to 11	5½	7 o.d.
8¾ to 9	4½	7 o.d.
7⅞	4½, 3½	5½ o.d.
7⅞	3½	5½ o.d. and 5-in. welded
6¾	3½ Int. flush T.J.	4½ o.d., 9.5 lb.
6¼	2⅞ Int. flush	5 welded

The size of the hole and the size of the casing are also partially dependent on the proration restrictions and regulations placed on the well. In areas under severe curtailment of production, a small hole can produce much more than its allowable while in unrestricted areas a distinct advantage accrues from the larger hole.

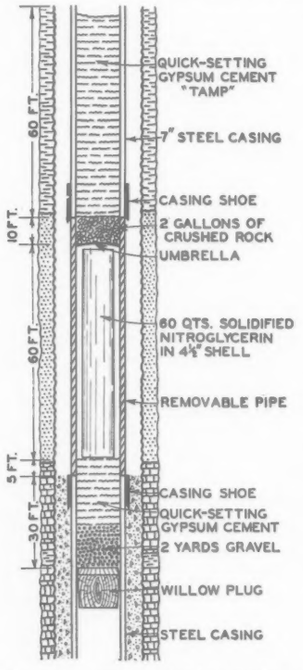
There is not much difference in hole sizes at the present time as 8¾-in. is about standard for most wells while 6¼-in. is the minimum size in which pipe should be set when there is intention of producing the well.

Slim-hole rigs are coming into increasing favor because of their low cost of operation and investment and the reduction in moving and rigging-up time. In shallow and medium-depth fields the mast-type rig is a common sight. Size of the masts varies with the depth of the holes and the taste of the operator.

A well recently drilled to 9,200 ft. on the Gulf Coast used a 129-ft., jack-knife, cantilever-type derrick with a special substructure. Surface casing used was 10¾-in. and was set at 1,435 ft. From under the surface casing to total depth, a 9⅞-in. hole was drilled.

A slim-hole rig designed for drilling 6,000-ft. holes can be mounted on a truck having rubber tires. Several of these are in use in Illinois. The 90-ft. derrick, or mast, has a capacity of 200 tons and is raised and lowered by hydraulic rams. This rig also included a fluid drive, hydraulic break-out lines, and a rotary head capable of driving a 3½-in. or 4½-in. kelly; whipping of the kelly during rotation was eliminated by the rotary head gripping it over a 48-in. length.

There are numerous other types of slim-hole rigs including the completely portable rig which has hoist, pump, driving engines and a 58-ft. open-faced derrick mounted on one truck. Others are of the single-skid type on which all of the essential machinery is mounted, including an 85-ft. derrick. Another type has the hoist, engines and pump on either one or two skids with a sectional derrick which can be assembled on the ground and raised with the hoist. Among these three types there are any number of variations.



Schematic drawing showing method of using quick-setting gypsum for tamp while shooting out a section of removable casing

Diagrama ilustrativo del método de rápido asentamiento de peso para apisonar, mientras se dinamita una sección de tubería desprendible

Cement Tamping for Nitroglycerin Shots

In one area, a new type gypsum cement, which sets quickly, has come into use for the tamping of nitroglycerin shots used to increase the production in sand wells. It is run in on top of the shot in a bailer made of drillable metal, sets within a few hours and reduces the time setting on the bomb. It is also easier to clean out after shot has exploded than the sand or gravel tamping. The special bailer is used so it can be drilled out easily in case it becomes stuck.

The shot is run in the hole in the regular manner and about a half yard of sand dumped on top of the umbrella after which the gypsum

(Continued on Page 189)

ente de dificultades. Si más tarde ha de manejarse una gran cantidad de agua, el ingeniero enfrentará entonces muy serias dificultades para la instalación del necesario equipo para resolver el problema. En caso de que el pozo vaya a completarse de nuevo, más tarde, por cualquiera razón, las dificultades asociadas al agujero pequeño se multiplicarán debido a la necesidad de usar pequeñas herramientas de perforación dentro del tubo pequeño.

Muchos explotadores prefieren perforar un agujero un tanto más grande y colocar un entubamiento o tubería más grande, con la esperanza de que la inversión adicional se liquidará mediante un mayor rendimiento. El tamaño del entubamiento en cualquier agujero podrá aumentarse con la eliminación de los collares de la tubería de tipo de tornillo, empleando, en lugar de ella, la de tipo soldado. A continuación damos una tabla de los tamaños de agujeros, tubo de perforación y entubamiento, usados en una zona típica.

Diametro del agujero perforado debajo del tubo de superficie, en pulgadas	Tamano del tubo de perforacion en pulgadas	Tamano del entubamiento en pulgadas
11	6⅝	8¼ d.e.
9⅞ a 11	5½	7 d.e.
8¾ a 9	4½	7 d.e.
7⅞	4½, 3½	5½ d.e.
7⅞	3½	5½ d.e. y 5 soldado
6¾	3½ int. pl. T.J.	4½ d.e., 9.5 lb.
6¼	2⅞ int. pl.	5 soldado

El tamaño del agujero y el tamaño del entubamiento dependen parcialmente de las restricciones y regulaciones del prorrateo impuestas sobre el pozo. En zonas sujetas a seras limitaciones de producción, un agujero pequeño podrá producir mucho más que su límite permitido, mientras que en zonas sin restricción, se presenta una ventaja evidente del agujero más grande.

No hay, al presente mucha diferencia en los tamaños de los agujeros. El de 8¾ pulgadas es el normal, para un gran número de pozos, mientras el de 6¼ pulgadas es el tamaño mínimo en que puede meterse la tubería, cuando no hay intención de activar el pozo.

Las torres de perforación de agujeros pequeños gozan de creciente demanda, debido a su bajo costo de explotación, reducida inversión y la reducción de tiempo de mudanza e instalación. En los campos de profundidad baja y mediana, la torre de tipo de mástil es cosa común. El tamaño del mástil varía con la profundidad de los agujeros y gusto del dueño.

Un pozo recientemente perforado a 9.200 piés en la Costa del Golfo, usó una torre de perforación de 129 pies, de tipo acodillado, con una subestructura especial. La tubería de superficie usada fué de 10¾ pulgadas y se puso a 1435 piés. Se perforó un agujero de 9⅞ pulgadas debajo de la tubería de superficie, a la profundidad total.

Una torre de perforación de agujero pequeño, para perforar agujeros hasta de 6000 piés, puede montarse en un camión con ruedas provistas de neumáticos. Varios de estos equipos se usan en Illinois. La torre o mástil de 90 piés tiene una capacidad de 200 toneladas y se sube y baja por arietes hidráulicos. Esta torre incluye también una propulsión flúida, cables accionados por fuerza hidráulica y una cabeza rotativa capaz de impulsar un kelly de 3½ o de 4¼ pulgadas. La vibración del kelly, durante la rotación, se eliminó haciendo que la cabeza rotativa lo sujetara en una extensión de 48 pulgadas.

Hay numerosos otros tipos de torres de perforación para agujeros pequeños, incluyendo la completamente portátil, que comprende torno, bomba, motores de propulsión y una torre abierta de 58 piés, montada en un camión. Otros son del tipo de patín simple, sobre el cual se instala toda la maquinaria esencial, incluyendo una torre de 85 piés. Otro tipo tiene torno, motores y bomba en uno o en dos patines, con una torre seccional, que puede montarse en el suelo y levantarse con el torno o grúa. Entre estos tres tipos existen numerosas variaciones.

Atacadura de cemento para tiros de nitroglicerina

En una zona, un nuevo tipo de cemento de yeso, que se endurece rapidamente, se está usando para atacar o apisonar los tiros de nitroglicerina que se emplean para aumentar la producción en pozos de arena. Se baja encima del tiro colocado en un achicador hecho de metal perforable, y se endurece dentro de pocas horas, acortando el tiempo de fijación en la bomba o tiro. Es mucho más fácil de limpiar, después de la detonación, que la atacudura de arena o grava. Se usa un achicador especial, a fin de poder perforarlo facilmente en caso de que se atasque.

El tiro se baja en el agujero de la manera corriente, y se echa como una media yarda de arena encima de la cubierta, después de lo cual se mete el cemento de yeso en el agujero, calculándose como 20 piés de cemento por cada 10 cuartos de galón en el tiro. No se necesita ningún apisonamiento o atacadura adicional. En los casos en que se sospenche que haya un hueco en el cemento, detrás de la tubería, se coloca como media yarda de arena encima de la atacadura de cemento y el resto del agujero se llena con petróleo. Una compañía usa una atacadura de 4 a 5 piés de piedrecitas de 1½ pulgada encima de la cubierta, antes de aplicar la atacadura de cemento. El cemento toma como dos horas para endurecerse, y siempre se prueba antes de la descarga del tiro. En caso de que el yeso sea agitado por el gas, se convierte en una masa esponjosa.

Flúido de barro y pérdidas de circulación

Numerosos progresos se hicieron en el tratamiento del barro, como re-

(Continue en Pagina 189)

Equipment . . .

EL WIGGINS BALLOON ROOF (Techo Wiggins de Globo) convierte en práctico y lucrativo el principio del techo respirador al aplicarse a los tanques de almacenaje corriente chicos que no se conservan siempre llenos.

EL HORTONSPHEROID (Esferoide Horton) se usa muy generalmente en capacidades hasta de 30.000 barriles como recipiente de almacenaje bajo presión, para presiones hasta de 30 libras por pulgada cuadrada. Se usa también en tamaños mayores para manejar combustibles de alta potencia para motores, a presiones desde 2½ hasta 10 libras por pulgada cuadrada.

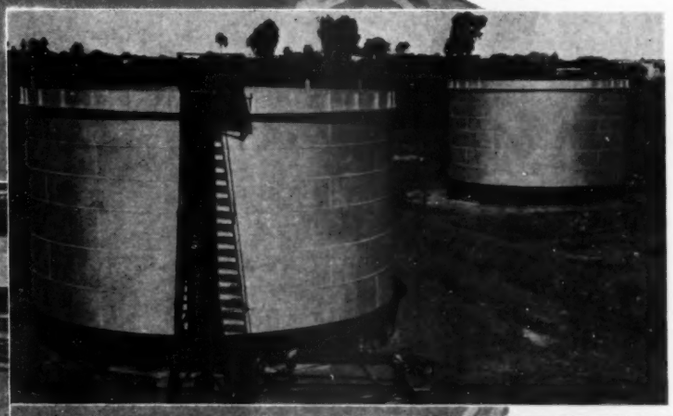
EL WIGGINS BREATHER ROOF (Techo Wiggins Respirador) rara vez se iguala por cuanto a la utilidad que rinde en los tanques de almacenaje corriente, de diámetro de 60 pies o más, que se mantienen llenos o casi llenos la mayor parte del tiempo.

EL WIGGINS PONTOON ROOF (Techo Wiggins de Pontón) se usa en todas partes del mundo como dotación normal para los tanques de uso corriente en que se manejan productos de petróleo que no hierven a presiones atmosféricas ordinarias.

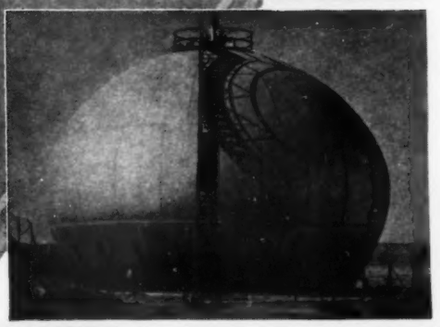
LA HORTONSPHERE (Esfera Horton) es un recipiente moderno para almacenar bajo presión, que se encuentra disponible en capacidades de desde 1.000 hasta 20.000 barriles, para presiones desde 25 hasta 250 libras por pulgada cuadrada.

EL WIGGINS BALLOON (Globo Wiggins) es una construcción más grande, cuyo fin es el de servir como recipiente central para gases en las instalaciones para la preservación de los vapores o emanaciones, que se usan para grupos de tanques conectados universalmente entre sí por medio de tuberías herméticas contra los fugas de los gases.

ARGENTINA—La Compañía Nativa de Petróleos, S. A. usa Techos Wiggins de Pontón en los tanques de almacenaje para petróleo *(derecha)* y en los tanques de refinería *(abajo)* en su refinería de Campaña.



PERU—A la derecha se muestra un Hortonspheroid (Esperoide Horton) de 10.000 barriles construído para la Lobitos Petroleum Co., de Lobitos, Perú.



VENEZUELA—La Hortonsphere que se muestra a la derecha se usa para almacenar gas natural a presión de 50 libras por pulgada cuadrada, para el servicio de Maracaibo, Venezuela. La lámina de abajo muestra un Hortonspheroid de 2.500 barriles construído para la Anglo Ecuadorian Oil Fields, Ltd, en La Libertad, Ecuador.

ECUADOR—A la derecha se ve un tanque de 5.710 barriles para gasolina para motores, provisto de un Techo Wiggins de Globo, instalado en una estación para ventas al por mayor en Quito, Ecuador.

& IRON COMPANY

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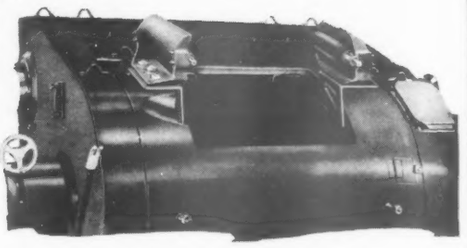

Fig. 6

GRIZZLY

High Quality
OIL FIELD PRODUCTS

Each item in the "Grizzly Line" is a highly specialized product, especially designed and carefully engineered for efficient, dependable performance under all operating conditions. Use of Grizzly products will quickly pay profitable dividends in one or more ways . . . maximum safety to life and property; high operating efficiency; savings in time, labor, materials; and reduced operating costs. Write for bulletins covering products listed.

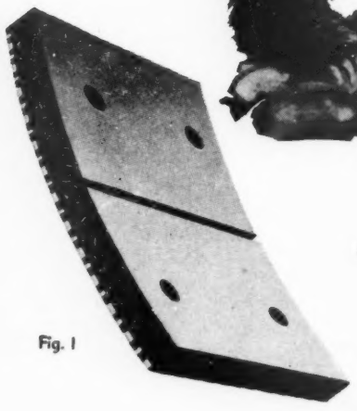

Fig. 1

Figs. 1 and 7. GRIZZLY ROTARY BRAKE BLOCKS . . . Hold the load safely at any depth; speed up drilling; smooth the rims, prevent such hazards as scoring of drums; eliminate practically all brake and drum troubles. Embody the correct coefficient of friction to insure perfect brakes and long life. Heat resisting . . . will not dust or smoke. Available for all types of brakes and all drum diameters, for all types of drawworks, well pulling machines and winches. Bulletin No. 11-OF.

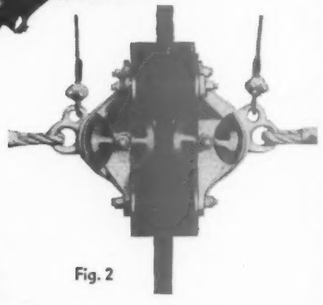

Fig. 2

Fig. 2. GRIZZLY *"No-Wip"* LINE SAVER A flexible unit that can be installed at any point in the derrick and functions perfectly at any angle regardless of where installed. A simple, perfectly balanced, thoroughly engineered device that will save miles of wire lines every year, and cut line costs to minimum. Forces the line to track perfectly, eliminates whipping, prevents piling-up at any point on the drum and avoids exorbitant expense resulting from excessive wire line wear. Write for Bulletin No. 10-OF.

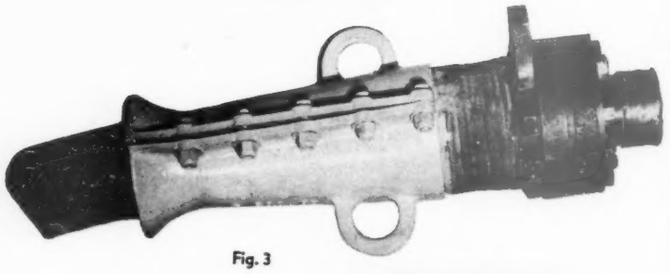

Fig. 3

Fig. 3. GRIZZLY *Pressure Seal* ROTARY HOSE . . . No Nipples to Cut Out; Positive Automatic Seal; No Leaks; No Coupling Troubles; No Tightening Ever Required; Full Flow Throughout. A carefully engineered product developed to withstand the hard service and terrific pressures involved in drilling wells to any depth. Embodies a new perfected, pressure seal coupling built integral with the steel armored hose in such a manner that it is absolutely impossible for the coupling to pull out or blow out, or for any leaks to develop at this vital point. Designed to eliminate all rotary hose troubles. Complete assembly at the factory provides a complete trouble-proof unit ready for immediate use. Hook it up and forget about hose troubles. Also available with Neoprene tube, at slight additional cost. Write for Bulletin No. 20-OF.

Fig. 4

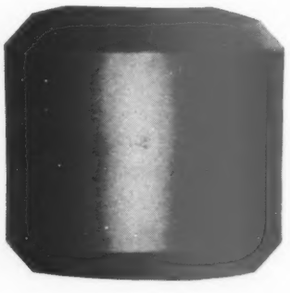

Fig. 5

Figs. 4 and 5: GRIZZLY *"Hug-Tite"* DRILL PIPE PROTECTORS and STABILIZERS. Provide maximum protection all the way to bottom in casing and open hole drilling. Sizes designed to function properly in each different size of casing and bottom open hole assure smooth rotating drilling string; eliminate whipping or bending of drill pipe; with large savings in pipe costs; eliminate tool joint troubles with large potential savings in tool joint costs and maintenance; permit more weight on drilling bit and faster completion of wells. Bulletin No. 21-OF.

Fig. 6. GRIZZLY WIRE LINE TURN BACK . . . A simple yet ingenious device that saves wire lines and prevents innumerable troubles by forcing the line back smoothly and evenly as it reaches each end of the drum. Eliminates all possibility of contact with drawworks housing, drum flanges, or any part of rig or equipment regardless of how much it bows or whips, and also prevents line from piling up at ends of drum when spooling. Supplied in two types for either bolting or welding on drawworks guard. Write for Bulletin No. 19-OF.

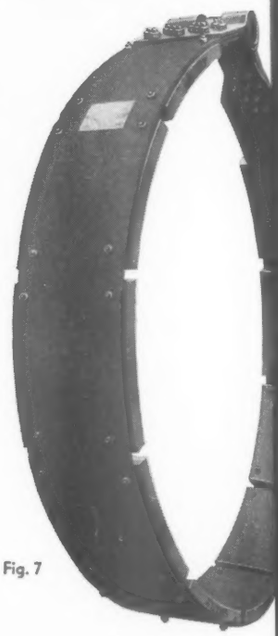

Fig. 7

Mail Coupon for Bulletins on Grizzly High Quality Oil Field Products.
E. M. SMITH COMPANY, 600-650 South Clarence St., Los Angeles, California, U. S. A.

Please send illustrated Grizzly Bulletins checked

- No. 21-OF Drill Pipe Protector . . ☐
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- No. 19-OF Wire Line Turn Back . ☐
- No. 20-OF Pressure Seal Rotary Hose ☐

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PRODUCTOS de superior calidad para CAMPOS DE PETROLEO

Cada producto del surtido "Grizzly" es un artículo altamente especializado, proyectado y construído para rendir un servicio eficaz y seguro bajo todas las condiciones de trabajo imaginables. El uso de los productos Grizzly pronto pagará dividendos en varios sentidos . . . seguridad máxima en beneficio de la vida y propiedad; gran rendimiento efectivo; ahorro de tiempo, trabajo y materiales, y reducción en los gastos de explotación. Pídanos los boletines correspondientes a los productos que le interesen.

Figs. 1 y 7. BLOQUES DE FRENO GIRATOR GRIZZLY . . . Sujetan la carga con seguridad a cualq profundidad; aceleran la perforación; suavizan las llan evitan los peligros de rayar los tambores; suprimen todas las irregularidades de frenos y tambores. Se ofrec correctos coeficientes de fricción o rozamiento, para gurar perfecta acción de freno y prolongada duración. sistentes al calor . . . no se pulverizan ni humean. Se cen para todo tipo de freno y diámetro de tambor, para tipo de aparejo de maniobras, máquinas de izar y ma tes de pozos de petróleo. Boletín No. 11-OF.

Fig. 2. ECONOMIZADOR DE CABLE GRIZ "NO-WIP" . . . Un dispositivo muy adaptable, que instalarse en cualquier punto de la torre de perforación, un funcionamiento perfecto a cualquier ángulo, no im donde quede colocado. Es un dispositivo sencillo, perf mente compensado y muy bien proyectado y construído, ahorrará kilómetros de cable todos los años, reduciend un mínimo el gasto en cables. Obliga al cable a seguir correcta dirección, suprime la desviación, impide el s miento en cualquier punto del tambor y elimina el p exhorbitante que resulta del excesivo desgaste de c Pídanos nuestro boletín No. 10-OF.

Fig. 3. MANGUERA GIRATORIA GRIZZLY con erre de Presión . . . No hay que cortar niples; cierre s mático positivo; no hay escapes; ninguna irregularidad acoplamiento; nunca se requiere apretadura; corriente c dita y completa. Un producto cuidadosamente proyect perfeccionado para resistir el servicio más severo y las mendas presiones que se presentan en la perforación de quiera profundidad. Comprende un nuevo acoplamient cierre de presión, que forma parte integrante de la manga acorazada de acero. Esta dispuesto de tal manera que absolutamente imposible la separación o la reventazon acoplamiento, o el desarrollo de escape o fuga por punto tan importante. Esta proyectada para eliminar t las irregularidades de manguera giratoria. Su montaje pleto en la fábrica significa una manguera completa, ex de faltas, lista para uso inmediato. Sencillamente se gancha o conecta, y no hay más dificultades. Se ofr también con tubo de Neopreno, a poco precio adicion Pídanos nuestro boletín No. 20-OF.

Figs. 5 y 5. PROTECTORES DE TUBERIA DE R RFORACION y ESTABILIZADORES GRIZZLY "H Tite" . . . Representan protección máxima hasta el fon para la tubería de perforación y de revestimiento. Tama exactamente adaptados al correcto funcionamiento en c tamaño diferente de revestimiento, y el agujero abierto fondo asegura acción expedita a la perforación; elimina desviación o dobladura de la tubería de perforación, grandes ahorros en costo de tubería; evita las irregularida en las uniones de espiga y cajas para herramientas, grandes ahorros en el funcionamiento y conservación de es materiales; permiten mayor carga o peso en las barrenas perforación y aceleran la perforación de los pozos. Pídan nuestro boletín No. 21-OF.

Fig. 6. RETORNADOR DE CABLE GRIZZLY. Un sencillo e ingenioso dispositivo, que da protección a cables de alambre contra comunes inconvenientes, obligán al cable a regresar suave y uniformemente tan pronto co llega alcada extremo del tambor. Evita toda posibilidad contacto con la cubierta del aparejo de maniobras, rebote de los tambores o cualquiera otra pieza de la torre o equipo. También impide que el cable de apile en los ext mos del tambor, al arrollarse. Se suministra en dos tipo para sujeción por perno o para sujeción por soldadura en resguardo del aparejo de maniobras. Pídanos nuestro bole tín No. 19-OF.

(Continued from Page 184)

cement is run in the hole, about 20 ft. of the cement being allowed for each 10 qt. in the shot. No other tamping is needed although in cases where there is any reason to suspect a void in the cement behind the casing, about a half yard of sand is placed on top of the cement tamp and the remainder of the hole filled with oil. One company uses a 4 to 5-ft. tamp of 1½-in. chat on top of the umbrella before running the cement tamp. About 2 hours are allowed for the setting of the cement and it is always tested shortly before time for the shot to be discharged. In case the gypsum cement is agitated by gas, it becomes a spongy mass.

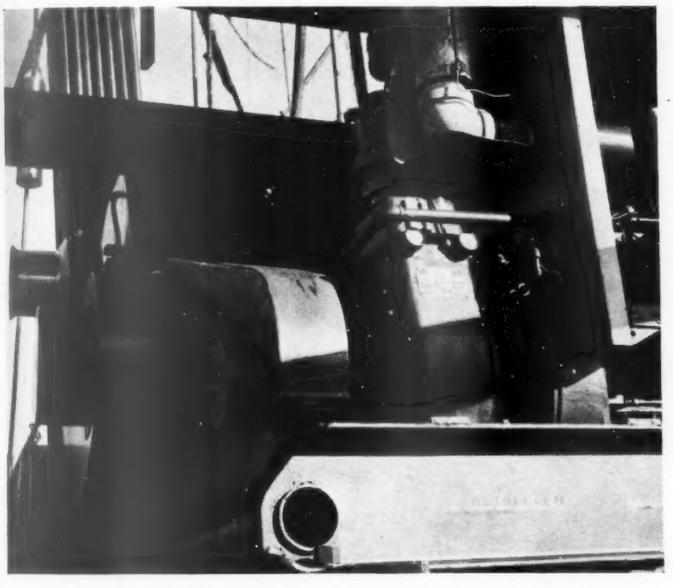
Mud Fluid and Circulation Losses

Numerous advances were made in mud treatment as a result of the broad research into the problem during the past several years. One method introduced of stopping the loss of circulation to extremely porous formations was the addition of regenerated cellulose fiber (cellophane) to the drilling mud. This material is chemically inert and is fabricated into paper-thin particles. It is not deteriorated by mud, water, oil or cement slurry. The particles are crinkled to prevent their sticking together when used in mud or cement slurry. The porous formation may be sealed by means of these particles before cementing is started or they can be added directly to the cement.

The effect of formation permeability on the plastering behavior of muds was studied by H. T. Byck, who pointed out that the porosity of the formation had little effect on the behavior of mud. In order to establish the influence of the property of the formation on water loss and sheath thickness, extensive experiments were conducted in a high-pressure filter press on real and synthetic cores having permeabilities ranging from 10 to 14,500 millidarcys. Within limits it was evident that in unfractured formations the plastering behavior was independent of the formation permeability.

Use of chemicals in mud has come in for increasing attention and complex sodium phosphates seem to be the most widely used. Success with chemical treatment requires a specialist who can determine the reaction of the various chemicals with the mud. Many companies are now employing mud engineers who have complete control of this one drilling agent. The use of complete records of the mud condition at regular intervals along with the treatment being applied has been found very helpful in reducing the cost of mud on the well.

Generally the trend is toward low-viscosity muds which will still perform the work. This will permit the hole to be drilled faster and cheaper. In addition to the numerous advances in developing the proper colloidal condition in the mud, attention has been paid to mechanical aids which will clean and degas the mud. Several methods for decreasing the time for making essential tests were also introduced.



Torque converter used on hoist powered by a single combustion engine

Convertidor de esfuerzo de rotación usado en un montacargas accionado por un solo motor de combustión interna

Wire Drilling Cables

The experience of one drilling contractor shows that a saving in wireline costs may be effected by reducing the total weight of the tools and at the same time increasing the length of the stroke. Use of swivel sockets with the above arrangement makes it possible to maintain the desired drilling motion, and has also reduced the difficulty of keeping the

(Continue desde Pagina 184)

sultado del vasto estudio del problema durante estos últimos años. Un método introducido para parar las pérdidas de circulación a formaciones extremadamente prosos, fué la adición de fibra de celulosa regenerada (celofane) al barro de perforación. Este material es químicamente inerte y se fabrica en partículas delgadas como un papel. No se deteriora con el barro, agua, petróleo o solución de cemento. Las partículas no se adhieren entre si cuando se usan en solución de barro o cemento. La formación porosa puede taparse por medio de estas partículas, antes de la cementación, o bien, puede agregarse al mismo cemento.

El efecto de la permeabilidad de la formación sobre la acción tapadora del barro fué estudiado por H. T. Byck, quien señaló que la porosidad de la formación tiene poco efecto sobre el compartamiento del barro. Para establecer la influencia de la propriedad de la formación sobre la pérdida de agua y espesor de la capa, se llevaron a cabo muchos experimentos en una prensa filtradora de alta presión, en núcleos naturales y sintéticos con permeabilidades de 10 a 14.5000 milidarcis. Dentro de ciertos límites, se hizo evidente que en formaciónes sin fracturar, el efecto tapador fué independiente de la permeabilidad de la formación.

El uso de substancias químicas en el barro ha recibido creciente atención y los fosfatos de sodio complejos parecen tener la mas vasta aplicación. El éxito con el tratamiento térmico requiere los servicios de un specialista que pueda determinar la reacción de las varias substancias químicas aplicadas al barro. Muchas compañías están ahora empleando ingenieros especialistas en barro, que tienen a su cargo la dirección completa de este agente de perforación. El uso de datos completos de la condición del barro, a intervalos regulares, en combinación con el tratamiento que se aplica, se ha visto que es de mucha ayuda en reducir el costo del barro de un pozo.

En general, la tendencia es hacia barros de baja viscosidad, que puedan hacer todavía el trabajo. Esto permite perforar el agujero con mayor rapidez y economía. En adición a los numeros progresos en el desarrollo de una adecuada condición coloidad en el barro, se ha dado atención a las ayudas químicas para la limpieza y la depuración del gas del barro. También se introdujeron varios métodos para reducir el tiempo de los ensayos esenciales.

Cables de alambre de perforación

La experiencia de un contratista de perforación muestra que es posible efectuar ahorro en el costo de cables de alambre reduciendo el peso total de las herramientas y al mismo tiempo aumentando la longitud de la carrera. El uso de casquillos giratorios con esta disposición hace posible mantener el deseado movimiento de perforación, y también ha reducido la dificultad de mantener recto el agujero durante el surte. Por otra parte, ha acelerado la rapidez de la perforación.

Se encontró dificultad en correr los manguitos giratorios debajo de 5000 piés, con el pasador en el segundo agujero de la manivela, pero cuando el pasador se movió al tercer agujero, gran parte de la dificultad desapareció. El lavantamiento de las herramientas, con el pasador en el segundo agujero, es 34 pulgadas, y con el pasador en el tercer agujero, 44 pulgadas.

Gradualmente, la longitud del vástago fué reducida a 25 piés y a este punto, casi todas las causas de irregularidades con el cable de alambre desaparecieron. Se descubrió también que con las herramientas de menor peso y una carrera más larga, se hacía el agujero con mayor rapidez que con herramientas pesadas y carreras cortas.

Correlación de la velocidad de perforación de las herramientas de cable y la profundidad

Un evidente aumento en la proporción de horas de paralización a tiempo de perforación puede observarse cuando las frecuencias de la perforación se apartan de las frecuencias naturales del sistema o de sus múltiples armónicos, mientras que podrá verse una reducción en el relativo número de horas de paralización cuando las frecuencias de la perforación se aproximan a las frecuencias naturales del sistema.

El factor perturbador para casi todos los perforadores parece ser los cambios drásticos y abruptos de la frecuencia de la perforación y su práctica es comenzar a la máxima frecuencia disponible y seguir luego una curva de gradual descendencia. Este procedimiento permite que la frecuencia cruce el programa ideal en varios puntos. Siguiendo las frecuencias establecidas por el sistema y cambiando radicamente el movimiento al tiempo oportuno, la velocidad de la perforación podrá aumentarse y reducirse el tiempo de paralización.

Terminación en varias zonas con tubería movible

La terminación de un pozo en varios horizontes de producción ha sido la meta de los ingenieros desde hace muchos años. La práctica de usar tubería movible fué por primera vez introducida en California y luego adaptada en Illinois donde la presencia de dos o más arenas en numerosos campos favoreció la rápida difusión de su uso.

Se usan dos tipos de tubería movible: la de aleación de aluminio y la de aleación de magnesio. La primera se quita mecánicamente y la segunda, con ácido. En algunos casos, el

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FILTROL PRODUCTS

hole straight and line cutting of the casing, it has moreover speeded up the rate of drilling.

Difficulty was encountered in running swivel sockets below 5,000 ft. with the pin in the second hole in the crank but when the pin was moved to the third hole much of the trouble disappeared. Lift of the tools when the pin is in the second hole is 34 in. and in the third hole it is 44 in.

By stages the length of the stem was reduced to 25 ft. and at that point most of the functional causes of wire-line trouble disappeared. It was also discovered that with the lighter-weight tools and a longer stroke, hole was made faster than with former arrangement which utilized heavy tools and a short stroke.

Correlation of the Drilling Speed of Cable Tools With Depth

A decided increase in the proportion of shutdown hours to drilling time may be observed where drilling frequencies depart from the natural frequencies of the system or its harmonic multiples, while a decrease may be seen in the relative number of shutdown hours where the drilling frequencies approach the natural frequencies of the system.

The disturbing factor to most drillers seems to be the abrupt and drastic changes in the drilling frequency and their practice is to start at the maximum frequency available and follow a gradually decreasing frequency curve; this procedure will permit the frequency to cross the ideal program at several points. By following the frequencies established by the system and radically changing the motion at the proper time, the drilling rate may be increased and the shutdown time reduced.

Multizone Completion With Removable Pipe

The completion of a well in several producing horizons has been the goal of engineers for a number of years. The practice of using removable pipe was first introduced in California and was then adopted in Illinois where the presence of two or more sands in numerous fields caused its use to become widespread.

Two types of removable pipe are used, the aluminum alloy and magnesium alloy. The former is removed mechanically and the latter is removed by acid. In some cases the soft metal-alloy pipe is used merely to hold the upper and lower steel sections of casing together while it is being run and cemented in the hole. Both types of pipe are suitable for this purpose.

If the pipe is to be removed immediately and it is not planned to have a rotary drilling rig over the hole at the time of removal, magnesium pipe is preferred, as the only thing necessary to remove it is an acid truck and a string of tubing. However, if it is left in the ground very long, it falls victim to corrosive subsurface water.

For this reason aluminum-alloy pipe is used where some time will elapse before its removal. A special mill with a guide on the bottom may be used for removal of the pipe or a wall-scraper or underreamer will serve equally well.

In isolated cases the procedure may be varied but the general practice is to run the alloy pipe at the point or points desired and then to complete the well in the lower zone and produce it until a satisfactory test has been obtained. The bottom zone is then sealed off by bridging and a cement plug. The potential producing zone immediately above it is tested by removing the alloy casing, pumping or flowing, shooting and testing. If a third zone exists, the second is sealed off just as was the bottom one and the well completed in the upper horizon. By alternately completing and sealing off, any number of zones can be tested and produced. When all zones have been opened, the plug can be removed by drilling out with a rock bit on the tubing or drill pipe and reversing circulation to wash out the cuttings.

Multiple-Zone Completion in Old Wells

In many cases, the presence of an upper producing zone may be overlooked in the early stages of development and a complete string of steel casing run in the hole. With a recently introduced tool, it is now possible to remove a section of steel pipe whenever desired. The procedure is much the same as multiple-zone completion where the alloy casing is used.

Shooting Out Removable Casing

One company is using nitroglycerin to remove alloy casing run in the hole opposite an upper producing formation. In this case both the casing above and below the shot must be protected by tamping. For the bottom tamp, a wooden plug is run about 30 ft. below the bottom of the section to be removed, a bridge made from a couple of yards of gravel and about 20 ft. of gypsum cement added to bring the tamp about 5 ft. up into the removable section.

From 10 to 60 qt. of solidified nitroglycerin in 4½-in. shells is placed in the hole. The solidified explosive is less dense and occupies more space than liquid nitroglycerin and the shot can be distributed more evenly in the hole; in addition the solidified nitroglycerin explodes with less velocity and the alloy pipe is more effectively consumed.

The umbrella for the upper tamp

(Continued on Page 194)

tubo de blanda aleación metálica se usa nada más que para sujetar las secciones de acero de arriba y de abajo del entubamiento, mientras se están colocando y cementando en el agujero. Ambos tipos de tubo se adaptan bien a este trabajo.

Cuando el tubo se quitará inmediatamente y no se proyecta instalar una torre de perforación por sistema rotativo sobre el agujero, al tiempo de su quitada, se prefiere entonces el tubo de aleación de magnesio, pues todo lo que se necesita para su remoción es un camión de ácido y una sola serie de tubería. Si ha de permanecer en la tierra durante mucho tiempo, quedará entonces expuesto al afecto corrosivo del agua subterránea.

Por esta razón, el tubo de aleación de aluminio se usa donde quedará puesto por algún tiempo, antes de su remoción. Para quitar este tubo puede emplearse un dispositivo con una guía al fondo, o bien un raspador de pared o escariador.

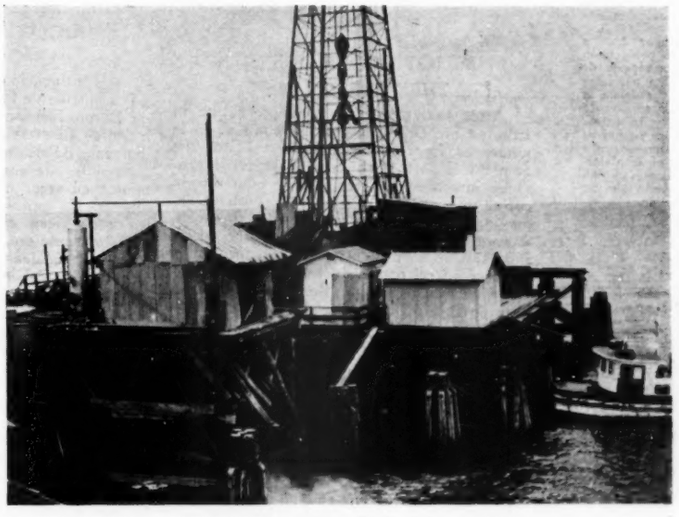
En casos aislados, el procedimiento puede variarse, pero la práctica general es meter el tubo de aleación

Terminación de varias zonas en pozos antiguos

En muchos casos, la presencia de una zona productora superior podrá haberse pasado sin ser apercibida en los primeras etepas del desarrollo, metiéndose una completa serie de tubería de acero en el agujero. Con una herramienta de reciente introducción es ahora posible quitar una sección de la tubería de acero, cada vez que se quiera. El procedimiento se parece mucho a la terminación de varias zonas, donde se usa el tubo de aleación.

Remoción a tiro de la tubería

Una compañía está usando nitroglicerina para quitar tubería de aleación metida en el agujero a opuesto a una formación productiva superior. En este caso, tanto la tubería arriba y abajo del tiro deben protejerse por tapones. Para la protección del fondo se introduce un tapón de madera



Rig used to drill 10 directional holes from one location

Aparejo de perforación para perforar 10 agujeros direccionales de un solo punto de ubicación

al punto o puntos que se deseen, y luego completar el pozo en la zona inferior y hacerlo producir hasta que se haya obtenido un ensayo satisfactorio. La zona inferior se tapa entonces con un puente y tapón de cemento. La zona productiva potencial inmediatamente encima es ensaya, quitando la tubería de aleación, aplicando extracción o corriente, dinamitando y finalmente ensayándola. De existir una tercera zona, se cierra o tapa la segunda, como se hizo con la inferior y se completa el pozo hasta el horizonte de arriba. Completando y tapando alternadamente, se pueden ensayar y producir varias zonas, de esta manera. Después de abiertas todas las zonas, se quitan los tapones perforándolos con barrena de roca en la tubería de perforación y se invierte la corriente para limpiar los cortes.

como 30 piés debajo del fondo de la sección por quitarse, y se agrega un puente hecho de un par de yardas de grava y como 20 piés de cemento de yeso, para formar un refuerzo de como 5 piés en la dirección de la sección quitable.

De 10 a 60 cuartos de galón de nitroglicerina solidificada, en cápsulas de 4½ pulgadas, se colocan en el agujero. El explosivo solidificado es menos denso y ocupa más espacio que la nitroglicerina líquida, y el tiro puede distribuirse más uniformemente en el agujero. Por otra parte, la nitroglicerina solidificada estalla con menos velocidad y por esta razón, el tubo de aleación es consumido más efectivamente.

La tapa o cubierta para la protección o apisonamiento superior se coloca de 5 a 7 piés debajo de la

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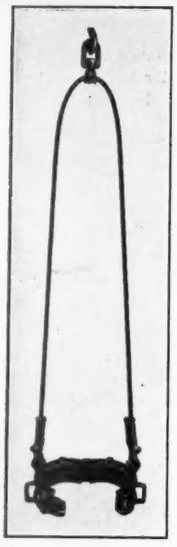
READY FOR YOU—FOR 1941



This elevator brings into the derrick the next joint of casing to be added to the string, lifts it when the block is raised, and holds it vertically suspended for lowering into the coupling. Made also without slips for collar-type pipe.

Este elevador trae a la torre de perforación la siguiente sección de revestimiento por agregarse a la cadena, la alza cuando se levanta el bloque y la sujeta en posición suspendida verticalmente para bajarla en el acoplamiento. Se hace también sin cuñas para tubo de tipo de collar.

These two pages will give you a preview of the new and improved BJ OIL TOOLS now ready to make your operations Safer and Faster They are designed and made to give long service and the combination of Safety, Time Saving and Long Life means maximum economy to you.

MODERN BJ HOOKS

The complete line of BJ Hooks ranges from the "300" Triplex for 300-ton loads while drilling, down to a BJ Rod Hook for 10-ton loads of sucker rods. All these hooks —whether for tubing work, drilling, or rod handling—have the famous BJ Locking Arm which connects the point of the hook to the body and forms a close C-link which adds to the strength and also holds the elevator links safely at all times.

ELEVATORS FOR EVERY NEED

There are BJ Elevators for setting casing—for tool joints with a shoulder—for external upset drill pipe—for tubing, and for sucker rods. Every size and type required is ready for you and described in the catalog illustrated below.

The BJ Casing Spider is proving very popular as it provides safety and convenience never before offered; see it in operation on the opposite page.

BJ ELLIOTT CORE DRILLS ARE THE WORLD'S BEST

After taking over the complete line of Elliott Core Drills, Byron Jackson Co. made numerous improvements in them, and the new BJ Elliott Wire Line Core Drill provides increased efficiency and economy in coring and drilling as you wish, without removing the drill pipe string from the well. Accurate, full-length cores are easily taken, and there is no difficulty in removing either the core barrel or the drilling assembly with the wire line overshot. Be sure to get the facts on this highly successful device.

BE PREPARED FOR 1941

The complete BJ OIL TOOL section in the 1941 Composite Catalog contains descriptions, illustrations and prices on the tools pictured on these two pages. In addition, separate BJ 1941 CATALOGS are ready—free to any oil men. The coupon below is for your convenience—we suggest that you cut it out, fill it in and mail now so that you have all the facts to order the BJ OIL TOOLS needed to make your 1941 operations Safer and More Profitable.

Estas dos páginas le darán a Vd. una idea de las perfeccionadas nuevas HERRAMIENTAS BJ para petroleros, ahora listas para introducir mayor seguridad y rapidez en sus trabajos. Están proyectadas y construidas para rendirle buen servicio por largo tiempo, y su combinación de seguridad, ahorro de tiempo y prolongada duración efectiva significa para Vd. economía máxima.

MODERNOS GANCHOS BJ

El completo surtido de ganchos BJ se comprende entre el Triplex "300" para cargas de 300 toneladas, mientras se está perforando, y el gancho de varilla BJ para pesos o cargas de 10 toneladas de varillas de bomba. Todos estos ganchos—ya para trabajo de entubamiento, perforación, o manejo de varillas—tienen el famoso brazo de cierre BJ, que contecta la punta del gancho al cuerpo, formando un eslabón cerrado en forma de C, que aumenta la firmeza y sujeta también, con seguridad, los eslabones del elevador todo el tiempo.

ELEVADORES PARA TODO REQUISITO

Hay elevadores BJ para la instalación de revestimiento—para uniones de espiga y caja para herramientas con un reborde—para tubería de perforación de recalcado exterior—para tubería y para varillas de bomba. Tenemos a su disposición todos los tipos y tamaños que necesite, los cuales se describen en el catálogo que ilustramos abajo.

La cruceta o araña BJ para revestimiento ha resultado muy popular, a causa de que ofrece una seguridad y conveniencia jamás antes vista. En la página siguiente ilustramos su funcionamiento.

LAS BARRENAS BJ PARA SACAR NUCLEOS SON LAS MEJORES DEL MUNDO

A continuación de tomar por su cuenta el completo surtido de barrenas Elliott para sacar núcleos, la Byron Jackson Co. introdujo numerosos refinamientos en estas herramientas. Por esta razón, la barrena BJ Elliott para sacar núcleos, accionada por cable, asegura ahora mayor rendimiento y economía en sacar núcleos y en perforación, como se quiera, sin quitar del pozo la tubería de perforación. Se sacan, con facilidad, núcleos exactos y de tamaño completo, y no hay dificultad en quitar la sonda sacanúcleos o el grupo de perforación con el enchufe "overshot" del cable. Asegúrese de obtener información completa sobre este excelente dispositivo.

PREPARESE PART 1941

La completa sección correspondiente a las herramientas BJ para petroleros, en el catálogo compuesto, contiene descripciones, ilustraciones y precios de las herramientas mostradas en estas dos páginas. En adición, tenemos listos catálogos separados de las herramientas BJ para 1941, que enviaremos gratuitamente a los interesandos en el ramo. El cupón de abajo es para su conveniencia. Le recomendamos que lo recorte, lo llene en debida forma y lo devuelva en seguida, para que tenga todos los datos que necesite para comprar las herramientas BJ que necesite para hacer su trabajo en 1941 más seguro y lucrativo.

The BJ "100" Triplex Hook is one of 4 sizes to meet all drilling needs.

El gancho Triplex BJ "100" es uno de los 4 tmaños para satisfacer todos los requisitos de perforación.

Triplex Hooks fit the largest blocks.

Los ganchos Triplex se adaptan a los bloques más grandes.

Connected to block by removing one bolt.

Conectado al bloque, quitando un solo perno.

Side locking arms retain links securely.

Los brazos laterales de cierre retienen bien los eslabones.

Easily locked to prevent rotation.

Se cierra con facilidad, para impedir la rotación.

Ready to receive the elevator links.

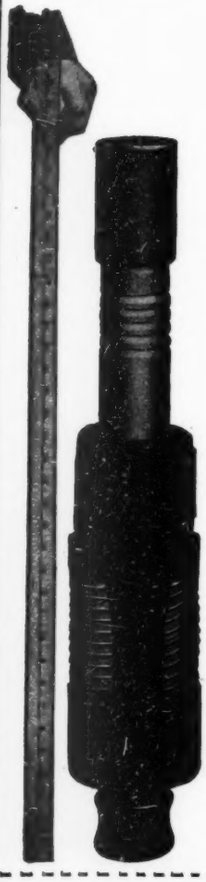
Listo para recibir los eslabones del elevador.

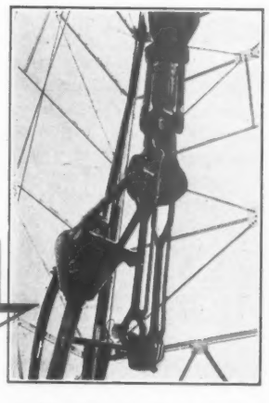
Ready to pick up the swivel bail.

Listo para levantar el achicador giratorio.

Perfect balance, with no off-center strains.

Equilibrio perfecto, sin tensiones decantradas.





A BJ "300-ton" Triplex Hook in service.

El gancho Triplex BJ de "300 toneladas" en servicio.

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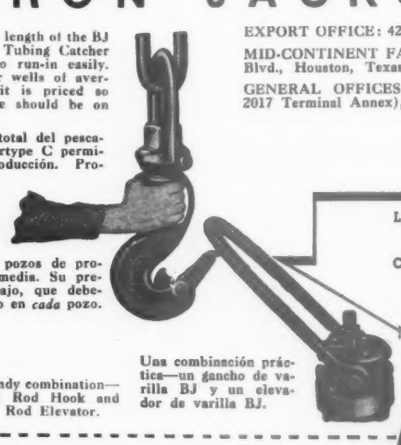
The over-all length of the BJ Shortype C Tubing Catcher enables it to run-in easily. Designed for wells of average depth, it is priced so low that one should be on *every* well.

La longitud total del pescatubo BJ Shortype C permite fácil introducción. Proyectado para pozos de profundidad promedia. Su precio es tan bajo, que debería usarse uno en *cada* pozo.



A handy combination—a BJ Rod Hook and a BJ Rod Elevator.

Una combinación prácticas—un gancho de varilla BJ y un elevador de varilla BJ.

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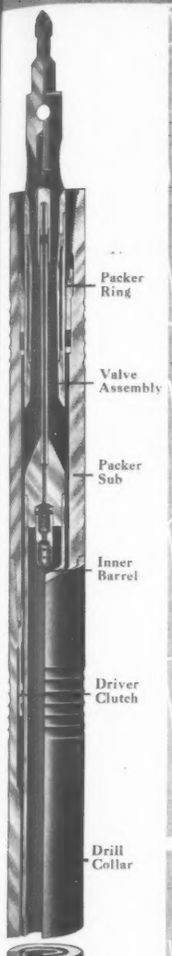
Company---------- **Address**----------

City---------- **County or State**----------

LISTO PARA VD.—PARA 1941



BJ "20-ton" Spring Rod Hook.
Gancho de varilla de resorte BJ de "20 toneladas".

BJ "75-ton" Tubing Hook.
Gancho de tubería BJ de "75 toneladas".

BJ "50-ton" Triplex Drilling Hook.
Gancho de perforación Triplex BJ de "50 toneladas".

BJ "300-ton" Triplex Hook.
Gancho Triplex BJ de "300 toneladas".

BJ Type A Drill Pipe Elevator.
Elevador de tubo de perforación BJ, tipo A.

BJ Weldless Links with new Wire Line Handle.
Eslabones sin soldadura BJ con nuevo mango para cable.

BJ Type LG Elevator for External Upset Drill Pipe.
Elevador BJ, tipo LG, para tubo de perforación de recalcado exterior.

BJ Slip Casing Setting Elevator.
Elevador BJ de revestimiento corredizo.

BJ Shock Absorbing Kelly Bushing.
Buje BJ para amortiguar el kelly.

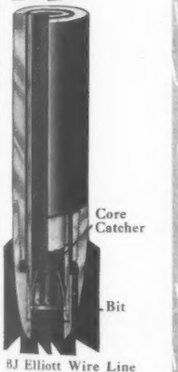
BJ Rod Elevator.
Elevador de varilla BJ.

BJ Snapon Tubing Tongs.
Tenazas de tubo BJ Snapon.

BJ Surestop Tubing Catcher.
Pescatubos BJ Surestop

BJ Elliott Rope Guard.
Resguardo de cuerda BJ Elliott.

A Distinguished Family



BJ Elliott Wire Line Core Drill ready for coring.
La barrena BJ Elliott para sacar núcleos, accionada por cable, lista para trabajar.

2-Way Bit for above Core Drill.
Barrena de dos aletas para el sacanúcleos anterior.

3-Way Bits are best for some formations.
Las barrenas de tres aletas son las mejores para ciertas formaciones.

Rock Bit and Core Catcher for Core Drill.
Barrena para roca y pescanúcleos para sacanúcleos.

BJ Rotary and Casing Tong.
Tenaza BJ rotatoria de tubería.

The modern BJ Casing Spider with casing being lowered.
La moderna cruceta arañá BJ para tubería bajando una tubería.

BJ Perfection Cable Tool Underreamer.
Ensanchador BJ Perfection de herramienta de cable.

UNA FAMILIA DISTINGUIDA QUE HARA MAS SEGURO Y LUCRATIVO *SU* TRABAJO.

ALL OF THE BJ TOOLS SHOWN ABOVE—AND MANY OTHERS—ARE IN THE NEW BJ SECTION IN THE 1941 COMPOSITE CATALOG!

TODAS LAS HERRAMIENTAS BJ MOSTRADAS ARRIBA — Y MUCHAS OTRAS MAS — SE INCLUYEN EN LA NUEVA SECCION BJ DEL CATALOGO COMPUESTO DE 1941

(Continued from Page 191)

is set from 5 to 7 ft. below the top of the removable pipe and the hole bridged in the regular manner. Then the proper amount (40 to 60 ft.) of quick-setting gypsum cement placed on top of it.

Radioactive Cement

Determination of the height of the cement behind the casing has been a standard practice for a number of years, as it shows whether the cement has channeled or whether large cavities or porous formations in the cemented portion of the hole are present.

Formerly the survey was made with an electrical-logging device which recorded the temperature in the hole while the cement was setting. The heat generated by the setting of the cement is sufficient to produce a sharp break in a temperature survey curve when the electrode arrives at a point opposite the cement. Frequently it was undesirable or impossible to make the survey during the time the cement was setting and many operators felt the need of some method which would permit a survey to locate the top of the cement at a later date.

This is now being done by gamma ray logging, a radioactive substance being introduced into the cement. When the gamma ray electrode is run in the hole, the top of the cement is readily identified by a sharp jump in curve similar to that of an ordinary temperature survey with regular cement.

In one field casing is set at approximately 4,800 ft. and is cemented with 300 sacks of portland cement: size of the casing is 7 in. and size of the hole is 9 in. Carnotite, a radioactive material, is mixed with first 25 sacks of cement to be pumped into the hole and the remaining 275 sacks are not treated. A mixture of 1 lb. of Carnotite to a sack of cement is used. The Carnotite does not interfere with the setting of the cement.

Rotation of Casing While Cementing

Channeling of cement behind the pipe, which will leave part of the casing exposed to corrosive ground waters and to vibration set up by the discharge of nitroglycerin shots, has been a problem causing operators considerable worry. The use of centering devices, whirler guides and spirals on the outside of the pipe are a great aid in eliminating channeling.

Another method, the rotation of the casing while the cement is being displaced around the pipe, is now being used. Casing is run in the regular manner except that provision is made for rotating it while the plug following the cement is being pumped down.

Care must be taken not to stall the casing and develop a reverse twist which would unscrew it. The pipe is started rotating slowly and brought gradually to a speed of 25 to 30 r.p.m. When the cement has been placed the casing is brought to a stop. Surveys run following jobs handled in this manner have shown no cases of channeling.

On several wells which have used this method it has been found that the cement has always occupied less than the calculated space. Ordinarily it is found much higher.

(Continue desde Pagina 191)

parte superior del tubo por quitarse, y se tapa el agujero de la manera corriente. Luego se echa la correcta cantidad de cemento de yeso (de 40 a 60 piés).

Cemento radioactivo

La determinación de la altura del cemento detrás de la tubería ha sido práctica corriente desde hace varios años, pues muestra si el cemento se ha acanalado o si hay presentes grandes cavidades o formaciones porosas en la parte cementada del agujero.

Antes, el estudio se hacía con un dispositivo eléctrico, que registraba la temperatura en el agujero mientras el cemento se estaba endureciendo. El calor generado por el endurecimiento del cemento es suficiente para producir una acentuada interrupción en una curva de estudio de temperatura, cuando el electrodo llega a un punto opuesto al cemento. A menudo, no convenía, o era imposible hacer el estudio mientras el cemento se estaba endureciendo, y muchos explotadores sientieron la necesidad de algún otro método que les permitiera hacer el trabajo para localizar la parte superior del cemento más tarde.

Esto se hace actualmente por un dispositivo a base de rayo gamma, introduciéndose una substancia radioactiva en el cemento. Cuando el electrodo del rayo gamma se introduce en el agujero, la parte superior del cemento se identifica facilimente por un salto en la curva, similar al de un estudio ordinario de temperatura con cemento corriente.

En un campo, la tubería se coloca a más o menos 4800 piés y se cementa con 300 sacos de cemento portland. El tamaño de la tubería es 7 pulgadas y el tamaño del agujero, 9 pulgadas. Carnotite, un material radioactivo, se mezcla con los primeros 25 sacos de cemento y se inyecta en el agujero, y los 275 sacos restantes no se tratan con este material radioactivo. Se usa una libra de Carnotite por saco de cemento. La Carnotite no afecta en sentido algundo el endurecimiento del cemento.

Rotación de la tubería durante la cementación

La canalización del cemento detrás de la tubería, que deja expuesta una parte de la tubería, a las aguas corrosivas subterráneas y a las vibraciones promovidas por los tiros de nitroglicerina, ha sido un problema que causa muchos inconvenientes a los perforadores. El uso de dispositivos de centración, guías giratorias y espirales por afuera de la tubería son de gran ayuda en la eliminación de la canalización del cemento.

Otro método, el de girar la tubería mientras el cemento se está desplazando alrededor de la tubería, se está usando ahora. La tubería se mete de la manera corriente, salvo que se gira mientras el tapón a continuación del cemento se va empujando hacia abajo.

Es necesario evitar que la tubería no se pare y desarrollo un movimiento invertido que tienda a desatornillarla. Se empieza lentamente la rotación de la tubería y poco a poco se aumenta su velocidad a 25 o 30 revoluciones por minuto. Cuando se ha colocado el cemento, se para el movimiento giratorio de la tubería. Los estudios, a continuación de esta instalación, muestran que no hay canalización de cemento.

Trends in Production Practices

Tendencias en Practicas de Produccion

A 1,000-gal. (4,546-litre) treatment of 15 per cent acid will dissolve approximately 10 cu. ft. (283,000 cc.) of limestone. If this volume is dissolved merely in enlarging the bore hole, minimum benefits are obtained. Maximum benefits are derived only when the acid spends itself in enlarging restricted drainage channels or in opening new channels to untapped oil. Realizing this simple truth, recent advancement in acid-treating practice has been concerned with placing the acid at the desired distance from the well bore before all of its ability to dissolve limestone has been dissipated.

For pumping acid and the oil load into the well the use of a series of pumps rather than a single pump has so increased the rate of application that "shots" formerly requiring hours are now introduced in a matter of minutes. This rapid application places active acid at a much greater distance from the well bore so that a greater area is made to respond to the treatment. While at one time acid shots were heated to promote rapid action, they are now introduced cold in all cases, and it is generally believed that the colder the solution is on introduction the better the result will be, as a smaller portion of the dissolving will take place adjacent to the well bore. For the same reason, additions are often made to the acid to delay its action.

Acid Treatment for Reduction of Gas-Oil Ratio

In areas where excessive gas-oil ratios exist it often is found that the

(Continued on Page 201)

UN tratamiento de 1000 galones (4.543 litros) de 15 por ciento de ácido disolverá aproximadamente 10 piés cúbicos (283.000 cm. cúbicos) de caliza. Si esta cantidad se disuelve en agrandar el agujero perforado, se obtienen beneficios mínimos. Los beneficios máximos se dereivan sólo cuando el ácido se gasta en agrandar canales de drenaje restringidos o en abrir nuevos canales al petróleo retenido. Comprendiendo esta simple verdad, el reciente progreso en la práctica del tratamiento con ácido se ha concentrado principalmente en colocar el ácido a la deseada distancia de la perforación del pozo antes de que toda su facultad para disolver la caliza se haya disipado.

Para inyectar el ácido ya la carga de petróleo en el pozo, el uso de una serie de bombas, más bien que una sola bomba, ha aumentado tanto la rapidez de la aplicación, que las inyecciones que antes necesitaban horas, se hacen ahora en cuestión de minutos. Esta rápida aplicación coloca en ácido activo a una distancia mucho mayor de la perforación del pozo, de modo que una mayor superficie queda así sujeta a responder al tratamiento. En un tiempo, las inyecciones de ácido se calentaban, para promover rápida acción, pero ahora se introducen, en todos los casos, frías, y se cree generalmente que mientras más fría está la solución durante su introducción, mejores son los resultados que se logran, debido a que una menor porción de la disolución se efectúa en puntos adyacentes a la perforación del pozo. Por la misma razón,

(Continue en Pagina 201)

Comodoro Rivadavia

Los importantes campos petrolíferos de Sud America, tal como Comodoro Rivadavia, en Argentina; el lago de Maracaibo, Venezuela; Petrolea, Colombia; Distrito de Bahía, Brazil; Negritos, Perú; Ancon, Ecuador y muchos otros están separados por millares millas de los campos petrolíferos semejantes en Estados Unidos de América. A pesar de su separación geográfica y lo que varia en pozos individuos y en algunas condiciones de operación, los campos de América del Norte y del Sur se unen por un "lazo" común . . . los problemas del subterráneo.

Ha sido no más de natural que Estados Unidos con su explotación anterior de tremendos recursos petrolíferos, ha sido el terreno de prueba para la industria de petróleo del mundo . . . un terreno de prueba en que se mensura con exactitud por prolijos ensayos experimentados en el campo, la eficiencia de nuevas herramientas, equipo, y métodos de operar. En cuanto a este trabajo de explotación, especialmente la porción que trata de ciertos aspectos de problemas del subterráneo, Baker Oil Tools, Inc. ha desempeñado una parte importante. Su más importante contribución ha sido el hacer disponible un surtido de "Prácticas y Seguras" Herramientas Petrolíferas las cuales han ayudado materialmente en el resolver algunos de los numerosos problemas que se han presentado acerca de la cementación moderna, reparación y operaciones de terminación de pozos.

La manera eficiente y segura de lo que el equipo "Baker" ha funcionado, aun bajo condiciones muy adversas, se ha demonstrado bien en todo importante campo petrolífero del mundo.

Las varias herramientas y dispositivos que componen el surtido "Baker" de "Prácticas y Seguras" Herramientas Petrolíferas se describen completamente en las páginas que siguen.

Se le ocurre a "Baker" que entre ellos se halle la solución de algunos de sus actuales y futuros problemas del subterráneo.

7000 miles apart but having the same sub-surface problems

The important oil fields of South America such as Comodoro Rivadavia in Argentina; Maracaibo Basin, Venezuela; Petrolea, Colombia; District of Bahia, Brazil; Negritos, Peru; Ancon, Ecuador, and many others are separated from their sister fields in the United States by many thousands of miles. In spite of their geological separation and such variables as individual well and operating conditions, the oil fields of North and South America are linked by a common bond . . . sub-surface problems.

It has been only natural that the United States, with its prior development of tremendous petroleum resources, has been the proving ground for the petroleum industry of the world . . a proving ground which has accurately measured by experience and exhaustive field tests, the effectiveness of new tools, equipment and operating methods. In connection with this development work, particularly that portion pertaining to certain phases of sub-surface problems, Baker Oil Tools, Inc. has played an important part. Its most important contribution has been making available a line of "Practical and Dependable" Oil Tools which have assisted materially in solving some of the many problems which have arisen in connection with modern cementing, well repair and well completion operations.

The efficient and dependable manner in which Baker equipment has operated even under most adverse conditions, has been ably demonstrated in every important oil field throughout the world.

The various tools and devices making up the Baker line of "Practical and Dependable" Oil Tools are fully described in the following pages. Baker suggests that among them you may find the solution to some of your immediate or anticipated sub-surface problems.

Huntington Beach, California

BAKER OIL TOOLS, INC.

Existe un tipo de material "Baker"

There is a type of Baker

Lake Maracaibo, Venezuela

Trátese del problema de guiar y flotar una columna de cañería larga y pesada, o ya del de colocar y cementar una columna en pozos de poca profunidad, existe un tipo de material "Baker" para cada operación: guiar, flotar, cementar—material que hará el trabajo con SEGURIDAD, EFICIENCIA y ECONOMIA.

ZAPATO FLOTADOR "BAKER"

Como se ilustra en la Fig. 1, la parte interior del Zapato Flotador "Baker" se compone enteramente de cemento, fórmula—"Baker", y una pequeña cantidad de Bakelita—materiales estos fácilmente perforables y eliminables por la inyección. El Zapato Flotador "Baker" lleva la eficiente Válvula "Baker", á BOLA flotante de Bakelita, la cual tiene la virtud de formar instantáneamente doble cierre contra un estrecho asiento de goma á la menor inversión de presión. Como toda Unidad de Flotación "Baker", este Zapato Flotador reune, en una combinación perfectamente equilibrada, las tres características "Baker": RESISTENCIA — EFICIENCIA DE VALVULA — TRITURABILIDAD.

ZAPATO GUIA "BAKER"

El interior de este Zapato (Fig. 2) está construído enteramente con cemento fórmula-"Baker". Posee las importantes ventajas de Resistencia y Triturabilidad. Por lo regular se emplea en combinación con una (ó más) Cupla Flotadora "Baker".

CUPLA FLOTADORA "BAKER"

Muchos perforadores prefieren, para la operación de bajar cañería, que la "válvula flotadora" principal vaya en una Cupla, colocada uno ó dos caños arriba del extremo inferior de la columna. La Cupla Flotadora "Baker" (Fig. 3) responde á este caso. Sirve, además, esta unidad para detener los tapones de cementación, reteniendo de esa manera dentro de la cañería los restos de cemento y proporcionando, así, una mejor consistencia al cemento en el exterior del zapato y de la cañería. La construcción interior de la Cupla Flotadora "Baker" es igual á la del Zapato Flotador "Baker" (Fig. 1).

Whether the problem is one of guiding and floating a long and heavy string of casing, or that of landing and cementing a string in shallow depths, there is a type of Baker Cement Guiding, Floating, Cementing Equipment to do the job . . . and do it SAFELY, EFFICIENTLY and ECONOMICALLY.

BAKER CEMENT FLOAT SHOE

As illustrated in Fig. 1 the internal construction of the Baker Cement Float Shoe consists entirely of Baker-Formula Concrete and a small amount of Bakelite . . . which are easily drilled up and circulated out of the hole. It is also provided with the efficient Baker BALL-TYPE Valve, with buoyant Bakelite Ball, which instantly double-seals against a narrow rubber seat at the slightest reversal of pressure. Like all Baker Floating Units, it combines in a perfectly balanced combination the three Baker features of STRENGTH—VALVE EFFICIENCY—DRILLABILITY.

BAKER CEMENT GUIDE CASING SHOE

The internal construction of this unit (Fig. 2) consists entirely of Baker-Formula Concrete, providing the important advantages of Strength and Drillability. It is usually used in combination with one or more Baker Cement Float Collars.

BAKER CEMENT FLOAT COLLAR

Many operators when setting casing, prefer to have the principal "float valve" in a Collar, positioned one or two joints from the bottom . . . and the Baker Cement Float Collar (Fig. 3) provides this feature. It also serves as a stop for the cementing plugs, thus retaining cement tailings

Fig. 1
Baker Cement Float Shoe
Product No. 100

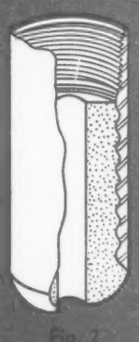


Fig. 2
Baker Cement Guide Casing Shoe
Product No. 102

...a satisfacer cualquier exigencia en la colocación

...r Equipment to meet every requirement in land...

ZAPATO FLOTADOR "BAKER" DE ACCION REMOLINO, DESCENDENTE

Este Zapato (Fig. 4), en su clase la más eficiente unidad de cementación hasta ahora ideada, reune todas las condiciones esenciales para llevar á cabo con éxito la colocación y cementación de cañerías. Empleando este Zapato se pueden obtener, con seguridad y eficiencia, los siguientes RESULTADOS: (1)—Se efectúa fácil y eficientemente la operación de GUIAR la cañería, gracias a la forma *redondeada* del extremo inferior (cemento) del Zapato, característica que sirve de guia á la cañería para pasar todas las irregularidades de las paredes del pozo. (2)—La FLOTACION se realiza sin inconveniente en virtud de la Válvula de Contrapresión, á BOLA, que ofrece un cierre hermético contra alta ó baja presión y una resistencia superior al punto de aplastamiento de la cañería. (3)—Se hace DESAPARECER LOS OBSTACULOS ("PUENTES") con la acción impelente (descendente) de la inyección en circulación, al pasar por los orificios laterales del Zapato, dispuestos en ángulo descendente. (4)—Se LAVA LAS PAREDES DEL POZO eficazmente, en el lugar á cementar y más arriba, acondicionándolas así convenientemente para la operación final de cementación. (5)—Se obtiene una MEJOR CEMENTACION debido á la positiva acción remolino, tanto ASCENDENTE como DESCENDENTE, que desarrolla el cemento en su recorrido alrededor del Zapato y (hacia arriba) de la cañería; esta acción de por resultado la colocación de un buen anillo, uniforme, de cemento alrededor de la cañería y reduce la canalización á un grado mínimo. (6)—Se está siempre seguro en cuanto á la TRITURABILIDAD del interior del Zapato, desde que el de la unidad que nos ocupa está compuesto en su totalidad de concreto fórmula—"Baker", más una pequeña cantidad de Bakelita; materiales, ambos, fáciles de romper, con el trépano en pequeños pedazos inofensivos, que salen sin dificultad del pozo, con la inyección.

inside the casing and insuring a better consistency of cement outside of the shoe and casing.

This unit has the same internal construction as the Baker Cement Float Shoe.

BAKER CEMENT WASH-DOWN WHIRLER FLOAT SHOE

This shoe (Fig. 4), the most efficient cementing unit of its kind yet devised, embodies all of the features essential for the successful landing and cementing of casing. It safely and efficiently accomplishes the following RESULTS: 1. GUIDING is easily and efficiently done, due to the rounded nose of the concrete guide which leads the casing past all side wall irregularities. 2. FLOATING is safely performed, due to the BALL-TYPE Back Pressure Valve, which provides a leak-proof seal against either high or low pressure and affords strength beyond the collapsing point of the casing. 3. REMOVING BRIDGES and WASHING DOWN is accomplished by the downward, hydraulicking action of the circulating fluid through the baffled "Down-Whirler" ports. 4. WASHING FORMATION at and above the cementing point effectively conditions the wall of the hole preparatory to the final cementing operation. 5. BETTER CEMENTING is accomplished by the definite DOWNWARD, as well as UPWARD, whirling action imparted to the

Petrolea, Colombia

CUPLA FLOTADOR... REMOLINO, CON... FORM...

Esta unidad (Fig. 5) p... cañería á cualquier profu... se emplea para cementar... de cemento, al chocar c... de La Cupla, se desvía y... movimiento remolino as... Provista de Válvula "Bak... éndose toda su construcc... exclusivamente, esta uni... dades de Resistencia, Efic... El Dispositivo "Canast... ("packer") exterior, dur... que impide la contamina... y la pérdida de lechada; ... ción" contra desprendim...

Además de servirse e... parte integrante de una ... ilustra en Fig. 5, dicho D... ado, convenientemente d... soldado, en el propio ... niples.

VALVULA DE RETE... Modelo "B." PA... ("D...

La Válvula de Retenci... para Barras de Sondeo ... de una válvula de contra... Su mecanismo interno ca... tiene en posición la uni... enrosca en la parte super... en cuestión. La válvula ... establece un cierre efecti... tiene máxima protección ... ("by-passing").

Fig. 3
CUPLA FLOTADORA "BAKER"
NUMERO DEL PRODUCTO 101

Fig. 3
Baker Cement Float Collar
Product No. 101

Fig. 4
ZAPATO FLOTADOR "BAKER" DE ACCION REMOLINO, DESCENDENTE
NUMERO DEL PRODUCTO 120

Fig. 4
Baker Cement Wash-Down Whirler Float Shoe
Product No. 120

Fig. 5
CUPLA FLOTADORA "B... ACCION REMOLINO, ... POSITIVO METALICO ... "CANASTA"
NUMERO DEL PRODU...

Fig. 5
Baker Cement Whirler Fl... with Solid Bottom Baffle w... "Petal" Basket
Product No. 30...

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FLOAT SHOE

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as UPWARD, whirling action imparted to the

Petrolea, Colombia

CUPLA FLOTADORA "BAKER" DE ACCION REMOLINO, CON DISPOSITIVO METALICO FORMA "CANASTA"

Esta unidad (Fig. 5) proporciona un medio para cementar cañería á cualquier profunidad que se desee; con frecuencia se emplea para cementar columnas combinadas. La lechada de cemento, al chocar con el fondo (de concreto) cerrado de La Cupla, se desvía y sale por los orificios laterales, en movimiento remolino ascendente alrededor de la cañería. Provista de Válvula "Baker", á Bola de Bakelita, y componiéndose toda su construcción interior de concreto y Bakelita exclusivamente, esta unidad posee las importantes propiedades de Resistencia, Eficiencia de Válvula y Triturabilidad. El Dispositivo "Canasta" que lleva hace de obstáculo ("packer") exterior, durante la operación de cementación, que impide la contaminación de la "formación" con cemento y la pérdida de lechada; protegiendo, además, á la "formación" contra desprendimientos.

Además de servirse el Dispositivo "Canasta" formando parte integrante de una unidad combinada, como la que se ilustra en Fig. 5, dicho Dispositivo se suministra por separado, convenientemente dispuesto (sobre un anillo) para ser soldado, en el propio yacimiento, á cañerías, uniones ó niples.

VALVULA DE RETENCION "BAKER," BAKWIK
Modelo "B," PARA BARRAS DE SONDEO
("DRILL PIPE")

La Válvula de Retención "Baker", 'Bakwik' Modelo "B", para Barras de Sondeo (Fig. 6) ofrece las muchas ventajas de una válvula de contrapresión en la columna perforadora. Su mecanismo interno carece en absoluto de rosca; lo mantiene en posición la unión macho de barre de sondeo que enrosca en la parte superior (hembra) de la unidad "Baker" en cuestión. La válvula está construída en forma tal, que establece un cierre efectivo é instantáneo, con lo cual se obtiene máxima protección contra costosos y peligrosos escapes ("by-passing").

cement in its travel around the shoe and upward around the casing . . . this action insures best possible encasement of the pipe with a uniform body of cement . . . minimizing channeling. 6. DRILLABILITY is always assured, as the internal construction of this unit consists entirely of Baker-Formula Concrete and a small amount of Bakelite, which are easily drilled up into small, harmless fragments and circulated out of the hole.

BAKER CEMENT WHIRLER FLOAT COLLAR with
SOLID BOTTOM BAFFLE with METAL
"PETAL" BASKET

This unit (Fig. 5) provides a means of cementing casing any desired depth and is widely used for cementing combination strings. A solid concrete baffle stops the cement and forces it out through the baffled side ports and up and around the casing with a whirling motion. With Bakelite Ball-Type Valve Assembly and internal construction consisting entirely of concrete and Bakelite, this unit possesses the important features of Strength, Valve Efficiency and Drillability. The Metal "Petal" Basket with which this unit is equipped serves as an outside packer or barrier during the cementing job. It also protects the formation from cement contamination and cavings, as well as prevents any dissipation of the cement slurry.

The Baker Metal "Petal" Basket can be furnished as a separate unit assembled on a ring suitable for welding on casing, joints, or nipples in the field; or can be furnished as an integral part of a Basket Assembly Unit, such as illustrated in Fig. 5.

BAKER BAKWIK Model "B" DRILL PIPE FLOAT

The Baker Bakwik Model "B" Drill Pipe Float with Model "B" Valve Assembly (Fig. 6), provides the many advantages of a back-pressure valve in the drilling string with a Valve Assembly constructed entirely without threads, being held in position by the tool joint pin above it. The Valve Assembly is so designed as to provide positive and instantaneous sealing, assuring long life and maximum protection against costly and dangerous by-passing.

OR "BAKER"
EMOLINO,
ENTE
ODUCTO 120

4
h-Down Whirler
hoe
No. 120

Fig. 4

Fig. 5
CUPLA FLOTADORA "BAKER" DE ACCION REMOLINO, CON DISPOSITIVO METALICO FORMA "CANASTA"
NUMERO DEL PRODUCTO 306

Fig. 5
Baker Cement Whirler Float Collar with Solid Bottom Baffle with Metal "Petal" Basket
Product No. 306

Fig. 5

Fig. 6
VALVULA DE RETENCION "BAKER"—BAKWIK MODELO "B" PARA BARRAS DE SONDEO ("DRILL PIPE")

Fig. 6
Baker Bakwik Model "B" Drill Pipe Float
Product No. 480

Fig. 6

South American Representatives
BAKER OIL TOOLS, INC.
Mr. J. Sanchez — 320 Defensa — Buenos Aires — Argentina, S. A.
Mr. S. B. Schaiter — No. 4 Mary Street — Port of Spain — Trinidad, B. W. I.

LA SOLUCIÓN A MUCHOS PROBLEMAS DE SUBTERRÁNEO

The Solution to many sub-surface problems

RETENEDOR DE CEMENTO "BAKER," Modelo "K"

El Retenedor de Cemento "Baker" (Fig. 7) resuelve muchos problemas, comunes y no comunes, de cementación, por cuanto constituye un medio seguro y sin peligro de colocar cemento, por medio de caños (de bombeo) ó barras de sondeo ("drill pipe"), en el punto preciso en que resultará verdaderamente fiecaz: alrededor del zapato; en cualquier lugar predeterminado detrás de la cañería; ó en la parte no entubada del pozo inmediatamente debajo de la cañería. Con el Retenedor de Cemento "Baker" queda reducido á un grado mínimo el riesgo de que se quede pegada al cemento la columna de cañería (de bombeo) ó de barras de sondeo ("drill pipe") que se emplee para cementar, ó de que el cemento fragüe dentro de dicha columna. El Retenedor de Cemento "Baker" se adapta á cualquier presión y resulta de especial conveniencia cuando la circulación es difícil ó imposible.

APLICACIONES IMPORTANTES

Cementación a Presión • Recementación • Cementación Detrás de Secciones de Cañería • Reducción de la Relación Gas/Petróleo • Cementación en Serie • Como Tapón Para Aislamiento de Fluidos de Fondo • Como Tapón "Puente" ("Bridge") en Cualquier Punto de la Cañería • Como Tapón Para Otras Varias Operaciones • Comprobación de "Formaciones" Superiores Entubadas • Toda Clase de Trabajos de Reparación en Pozos en Perforación o Producción que Estén Entubados.

PARA DETALLES COMPLETOS SOBRE EL RETENEDOR DE CEMENTO "BAKER" VEASE (SOLICITESE CASO NECESARIO) LAS SIGUIENTES PUBLICATIONES:

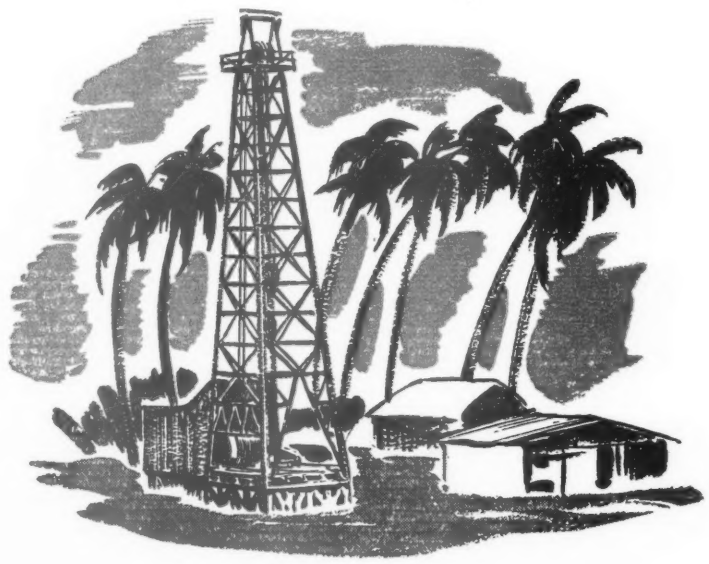
★ Sección "Baker" del "Composite Catalog" (Edición 1941) que consta de 72 páginas de materia informativa é ilustraciones, abarcando la Línea completa de Productos "Baker".
★ Catálogo "Baker" de 1941 (una reproducción de la Sección "Baker" del "Composite Catalog").
★ Secciones "Baker" del "Drilling Equipment Directory" (Edición 1940-1941).
★ Folleto "Baker" No. 17-A: un extenso tratado de 40 páginas describiendo é ilustrando las muchas aplicaciones importantes del Retenedor de Cemento "Baker", Modelo "K".
★ Servicio Informativo, exponiendo ideas prácticas relacionadas con el uso del Retenedor de Cemento "Baker" y sus últimas aplicaciones. Este servicio ha sido inaugurado recientemente. Si Vd. no está recibiendo los Boletines respectivos y desea que se le sirvan, solicítelos á: Baker Oil Tools, Inc., P. O. Box 127, Vernon Station, Los Angeles, California, EE.UU.A.

BAKER Model "K" CEMENT "RETAINER"

The Baker Cement Retainer (Fig. 7) solves many usual and unusual cementing problems by providing a sure and safe means of placing cement through tubing or drill pipe at the point where it will really be effective around the shoe; at any pre-determined location behind casing or liner; or in open hole immediately below the pipe. It minimizes the danger of sticking or plugging tubing or drill pipe by the "tubing" method of cementing; it is adaptable to any pressures, and is particularly suitable when circulation is difficult or impossible to obtain.

IMPORTANT APPLICATIONS

Squeeze Jobs • Re-Cementing • Cementing Behind Sections of Pipe • Reducing Gas/Oil Ratios • Series Cementing • Plugging Off Bottom Fluids • Plugging Back to Upper Zones • Testing Upper Cased Formations • As a Heaving Plug • As Bridge Plug at any Place in Casing or Liner • All Kinds of Repair Work in Drilling or Producing Wells Where Casing is in the Hole.



Trinidad

ENSANCHADOR 'ROTARY' "BAKE

El Ensanchador 'Rotary' "Baker" (Fig. 8) para ensanchar, con eficiencia y seguridad, l redes del pozo á una diámetro considerable mayor que el de la cañería por la cual se bajado dicha herramienta. Sus característica entes son: Resistencia y una Sorprendente C dad de Ensanche.

He aquí algunas de las applicaciones eficac Ensanchador 'Rotary' "Baker": Colocació Cañerías "Perdidas"; Colocación de Tapon Cemento; Asientos para Cementación; Ensa miento de Pozos para colocar Cañería de E ción; como igualmente para "Gravel Pack Rectificación de Pozos; Trabajos de Pesca; probación de Aislamientos de Agua; Elimi de Secciones de Cañería Perforable; y Extra de Testigos de las PAREDES de POZOS YA FORADOS, mediante la substitución de las ensanchadoras por otras especiales, saca-tes Este cambio convierte al Ensanchador "Bak un Saca-testigos de Pared cuya descripción en el párrafo que sigue.

SAGA-TESTIGOS DE PARED "BAK

Con esta herramienta (Véase Fig. 9) se obtener testigos en un punto cualquiera paredes de cualquier pozo sin entubar. Ell stituye un nuevo medio de restablecer reg desaparecidos de testigos, ó de comprobar "f ciones" de las que no se obtuvo testigos al t de ser perforadas. Igualmente sirve la he enta para verificar, en forma efectiva, zonas santes que se hayan descubierto empleando dos eléctricos.

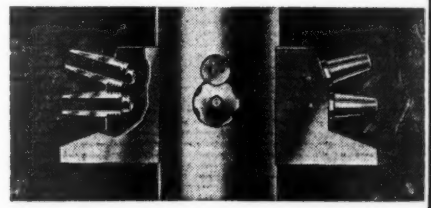


Fig. 9
DESCRIBIENDO LA FUNCION DEL SAGA-TESTIGOS DE PARED "BAKER"

Fig. 9
Showing Baker Rotary Wall Sampler in operation

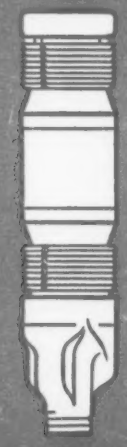


Fig. 7
RETENEDOR DE CEMENTO "BAKER" MODELO "K"
NUMERO DEL PRODUCTO 400

Fig. 7
Baker Model "K" Cement Retainer
Product No. 400

FOLLETO "BAKER" NO. 17-A: UN EXTENSO TRATADO DE 40 PAGINAS DESCRIBIENDO E ILUSTRANDO LAS MUCHAS APLICACIONES IMPORTANTES DEL RETENEDOR DE CEMENTO "BAKER", MODELO "K".

Baker Broadcast No. 17-A, a comprehensive 40-page treatise describing and illustrating the many important field applications for the Baker Model "K" Cement Retainer.

Printed in U. S. A.

PARA DETALLES COMPLETOS SOBRE EL ENSANC
SACA-TESTIGOS DE PARED "BAKER", VEASE (SO
CASO NECESARIO) LAS SIGUIENTES PUBLICA

★ Sección "Baker" del "Composite Catalog" 1941), que consta de 72 páginas de materia info ilustraciones, abarcando la línea completa de "Baker".
★ Catálogo "Baker" de 1941 (una reproducción ción "Baker" del "Composite Catalog").
★ Secciones "Baker" del "Drilling Equipment (Edición 1940-1941).
★ Folleto "Baker" No. 19, conteniendo informa plata acerca de las muchas aplicaciones prácticas chador/Saca-testigos de Pared "Baker". Consta de de información detallada é ilustraciones. Opinamos figurar en su archivo de consulta.

Eastern Venezuela

ENSANCHADOR 'ROTARY' "BAKER"

El Ensanchador 'Rotary' "Baker" (Fig. 8) sirve para ensanchar, con eficiencia y seguridad, las paredes del pozo á una diámetro considerablemente mayor que el de la cañería por la cual se haya bajado dicha herramienta. Sus características salientes son: Resistencia y una Sorprendente Capacidad de Ensanche.

He aquí algunas de las applicaciones eficaces del Ensanchador 'Rotary' "Baker": Colocación de Cañerías "Perdidas"; Colocación de Tapones de Cemento; Asientos para Cementación; Ensanchamiento de Pozos para colocar Cañería de Entubación; como igualmente para "Gravel Packing"; Rectificación de Pozos; Trabajos de Pesca; Comprobación de Aislamientos de Agua; Eliminación de Secciones de Cañería Perforable; y Extracción de Testigos de las PAREDES de POZOS YA PERFORADOS, mediante la substitución de las aletas ensanchadoras por otras especiales, saca-testigos. Este cambio convierte al Ensanchador "Baker" en un Saca-testigos de Pared cuya descripción figura en el párrafo que sigue.

SAGA-TESTIGOS DE PARED "BAKER"

Con esta herramienta (Véase Fig. 9) se puede obtener testigos en un punto cualquiera de las paredes de cualquier pozo sin entubar. Ello constituye un nuevo medio de restablecer registros desaparecidos de testigos, ó de comprobar "formaciones" de las que no se obtuvo testigos al tiempo de ser perforadas. Igualmente sirve la herramienta para verificar, en forma efectiva, zonas interesantes que se hayan descubierto empleando métodos eléctricos.

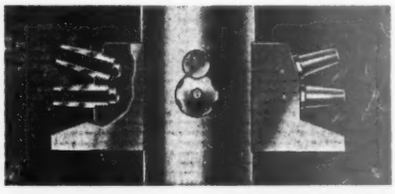


Fig. 9
DESCRIBIENDO LA FUNCION DEL SAGA-TESTIGOS DE PARED "BAKER"

Fig. 9
Showing Baker Rotary Wall Sampler in operation

Fig. 8
ENSANCHADOR 'ROTARY' "BAKER" NUMERO DEL PRODUCTO 500

Fig. 8
Baker Rotary Wall Scraper Product No. 500

BAKER ROTARY WALL SCRAPER

This tool (Fig. 8) provides a safe, efficient means of enlarging the walls of an open hole to a diameter considerably larger than the casing or hole through which the tool is run. Its outstanding features are Strength and an Amazing Reaming Capacity.

Efficient applications for the Baker Wall Scraper include: Setting Liners; Setting Cement Plugs; Bottlenecking for Cementing Purposes; Enlarging Holes for Casing; Enlarging Holes for Gravel Packing; Straightening Holes; Fishing Jobs; Water Shut-Off Tests; Removing Sections of Drillable Pipe . . . AND Taking Cores from Side Walls of a Previously Drilled Hole by Substituting Sampler Blades for the Regular Scraper Blades. This converts the Wall Scraper into a Baker Wall Sampler which is described below.

BAKER ROTARY WALL SAMPLER

With this device (See Fig. 9) it is possible to take actual cores from the side walls of any uncased hole at any depth and thus open up new opportunities for restoring lost core records, or for checking formations which were not cored when drilled through. It also provides a positive means of checking interesting zones brought out by electrical coring methods.

BAKER OIL TOOLS, INC.

P. O. Box 127, Vernon Station,
LOS ANGELES, CALIFORNIA, U.S.A.

Central Division Office and Factory:
6023 Navigation Blvd., HOUSTON, TEXAS

Export Sales Office:
19 Rector Street, NEW YORK, N. Y., U. S. A.

PARA DETALLES COMPLETOS SOBRE EL ENSANCHADOR/SACA-TESTIGOS DE PARED "BAKER", VEASE [SOLICITESE CASO NECESARIO] LAS SIGUIENTES PUBLICATIONES:

★ Sección "Baker" del "Composite Catalog" (Edición 1941), que consta de 72 páginas de materia informativa é ilustraciones, abarcando la línea completa de Productos "Baker".

★ Catálogo "Baker" de 1941 (una reproducción de la Sección "Baker" del "Composite Catalog").

★ Secciones "Baker" del "Drilling Equipment Directory" (Edición 1940-1941).

★ Folleto "Baker" No. 19, conteniendo información completa acerca de las muchas aplicaciones prácticas del Ensanchador/Saca-testigos de Pared "Baker". Consta de 40 páginas de información detallada é ilustraciones. Opinamos que debe figurar en su archivo de consulta.

FOR COMPLETE INFORMATION ON THE BAKER ROTARY WALL SCRAPER AND WALL SAMPLER REFER TO OR SEND FOR THE FOLLOWING:

★ Baker Section of the 1941 Composite Catalog containing 72 pages of informative text matter and illustrations covering the entire Baker Line of Equipment.

★ Individual 1941 Baker Catalog (a reprint of the Baker Section in the Composite Catalog).

★ Baker Sections in the 1940-1941 Drilling Equipment Directory.

★ Baker Broadcast No. 19, giving complete information covering the many practical applications for the Baker Wall Scraper and Baker Wall Sampler. It contains 40 pages of detailed information and illustrations and should be in your reference file.

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(Continued from Page 194)

gas comes either from the top of the oil-bearing zone or from another section of the formation above the oil zone. In the simplest type of treatment the theory is that the oil pay must be acidized without permitting acid to enter the gas horizon. When this is accomplished the oil production is increased without a corresponding increase in the gas production, and the net result is a lower gas-oil ratio.

In some wells the formation is so porous that oil cannot be pumped into the wells fast enough to fill them. In such wells oil is pumped into the tubing with the casing closed until the formation-feeding pressure is attained, or until the oil rises no higher in the well. Then acid is started into the tubing and after the pressure has begun to drop, oil is pumped rapidly into the casing by means of another pump. The oil being pumped into the casing overbalances the pressure exerted by the column of acid in the tubing and insures that the acid will not rise in the hole and enter the gas pay.

Acid-Jet Gun

This tool permits streams of acid to be shot out horizontally or vertically agains the walls or bottom of the well bore. The acid is projected through small-diameter nozzles, designed for removing magnesium-alloy pipe, cement, lime and calcareous deposits at a distance of 15 in. from the nozzle. This action may be obtained under fluid such as oil, water, acid or any fluid of approximately the same viscosity as acid, at 1,000-lb. per sq. in. differential pressure across the jets.

The acid-jet gun is used for:

1. Treating tight wells.
2. Removing cement sheaths.
3. Cleaning out cavings from wells.
4. Removing paraffin from face of pay.
5. Removing mud sheaths.
6. Drilling out cement plugs.
7. Dissolving magnesium-alloy pipe.
8. Deepening wells bottomed in limestone.
9. Cleaning gyp from face of pay, screens and liners.

Gas Lift

It has often been assumed that intermittent gas lift is capable of reducing gas-oil ratios only on wells of low productivity. However, results from recent tests prove that gas-oil ratios can be benefited by intermittent gas application even when wells are producing 800 bbl. or more per day.

Recently a number of bottom-hole gas-lift intermitters have been developed. Most of these operate by a differential-pressure principle which serves to open the valve to admit gas from the casing to the tubing. The valve is then closed by velocity of flow within the tubing.

The intermitter valve is installed near the bottom of a filling chamber. A small but constant flow of high-pressure gas is admitted to the casing at the surface. When the fluid level in the filling chamber reaches a sufficient height, the differential pressure between the casing and the chamber becomes so low that the spring in the flow valve opens the gas passage. The gas then discharges the oil from the filling chamber, and when the oil is removed from the well, the differential pressure between casing and filling chamber becomes great enough to close the intermitter valve against the action of the valve spring. The cycle is then repeated.

Another type of bottom-hole intermitter follows the same pressure-differential principle, but the intermitting valve is installed in a special tubing-seating chamber in much the same manner as an insert pump. It is run and withdrawn on a wire line in order to make it possible to change the valve setting without pulling the tubing.

The removable unit is held in place by cups which expand when subjected to the pressure of the input gas.

Surface-Controlled Bottom-Hole Intermitters

Many of the most recent intermittent gas-lift systems use an intermitter in the bottom of the hole that is controlled from the surface by some positive means. It should be remembered that in the original intermitter systems the valve controlling the intermittent flow of gas was placed in the gas line at the surface, and of course the controls for this valve and the timing device were also located at the surface. While this original system conserves gas in most cases as compared with straight gas lift, the bottom-hole intermitters were developed in order to make it unnecessary to refill the casing with high-pressure gas at each flow period. While this was accomplished by the automatic bottom-hole inter-

(Continued on Page 205)

(Continue desde Pagina 194)

se hacen, a menudo, adiciones al ácido, para retardar su acción.

Tratamiento por ácido para reducir la relación de gas y petróleo

En los lugares donde existen excesivas relaciones de gas y petróleo, se ve, a menudo, que el gas proviene de la parte superior de la zona petrolífera, o bien, de otra sección de la formación o yacimiento, arriba de la zona petrolífera. En el tipo más sencillo de tratamiento, la teoría es que el petróleo de paga debe acidularse, sin permitir que el ácido entre en el horizonte del gas. Cuando se realiza esto, se aumenta la producción de petróleo, sin un correspondiente aumento en la producción de gas, y el resultado neto es una menor relación de gas y petróleo.

En algunos pozos, la formación es tan porosa que el petróleo no puede ser inyectado en los pozos con bastante rapidez para llenarlos. En semejantes pozos, el petróleo es inyectado en la tubería, con la tubería de producción cerrada, hasta que se obtiene la presión de alimentación de la formación, o hasta que el petróleo no se alza más dentro del pozo. El ácido se inyecta entonces en la tubería, y después de que la presión ha empezado a bajar, se inecta rapidamente petróleo en la tubería de producción, por medio de otra bomba. El petróleo que se está inyectado por la tubería de producción contrapesa la presión ejercida por le columna de ácido en la tubería y asegura que el ácido no se levantará en el agujero y entre a la zona del gas de paga.

Pistola de inyección de ácido

Esta herramienta permite la inyección de una corriente de ácido. en sentido horizontal o vertical, en la pared o en el fondo del pozo perforado. El ácido es proyectado por boquillas de pequeño diámetro. que sirven para quitar tubos de aleación de magnesio, depósitos de hormigón, de cal o de otras substancias calcáreas, a una distancia de 15 pulgadas de la boquilla. Esta acción puede obtenerse bajo líquido, como petróleo, agua, ácido o cualquier otro flúido de más o menos la misma viscosidad del ácido, a 1000 libras por pulgada cuadrada de presión diferencial, a través de los chorros.

La pistola de inyección de ácido sirve para lo siguiente:

1. Tratar paredes apretadas.
2. Quitar revestimientos de hormigón.
3. Limpiar derrumbes de los pozos.
4. Quitar la parafina de la superficie de paga.
5. Quitar capas de lodo.
6. Abrir tapones de hormigón.
7. Disolver tubos de aleación de magnesio.
8. Profundicar pozos con fondo de caliza.
9. Limpiar las superficies de paga, coladores y tuberías.

Presión de gas

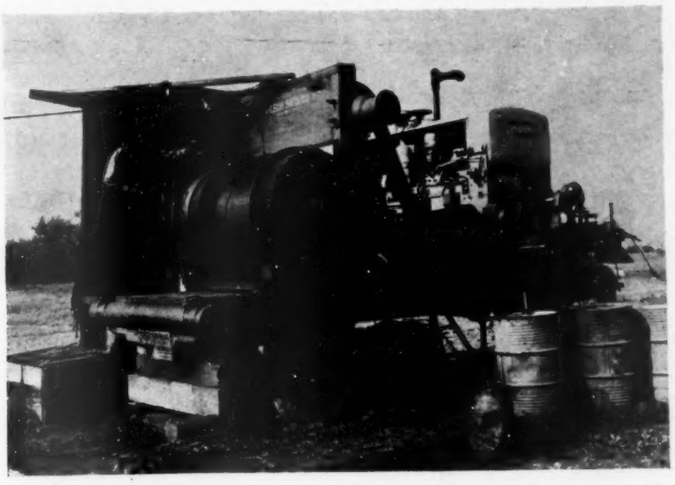
A menudo se ha asumido que la presión intermitente de gas es capaz de reducir las relaciones de gas y petróleo en pozos de poca productividad. Sin embargo, los resultados de ensayos recientes demuestran que las relaciones de gas y petróleo pueden beneficiarse por la aplicación intermitente de gas hasta en aquellos pozos que están produciendo 800 barriles o más al día.

Recientemente se han desarrollado varios aparatos intermetidores de presión de gas de agujero de fondo. Casi todos ellos funcionan por el principio de presión diferencial, que sirve para abrir la válvula que admite el gas de la tubería de producción al entubamiento.

La válvula del intermetidor está instalado cerca del fondo de una cámara de llenar. Una pequeña, pero contínua corriente de gas de alta presión, es admitida a la tubería de producción en la superficie. Cuando el nivel del líquido en la cámara de llenar llega a una altura suficiente, la presión diferencial entre la tubería y la cámara se reduce tanto que el resorte en la válvula de corriente abre el paso al gas. El gas descarga entonces el petróleo de la cámara de llenar, y cuando el petróleo es quitado del pozo, la presión diferencial entre la tubería y la cámara de llenar aumenta lo suficiente para cerrar la válvula del intermetidor contra la acción del resorte de la válvula. El ciclo se repite indefinidamente.

Otro tipo de intermetidor de agujero de fondo sigue el mismo principio de presión diferencial, pero la válvula intermitente está instalada en una cámara especial, de un modo muy similar a la instalación de una bomba insertada. Se sube y baje con un cable de alambre, para poder cambiar la posición de la válvula sin necesidad de sacar la tubería.

(Continue en Pagina 205)



A tire-mounted cleanout and well-repair machine. The bailer is run from a sand reel which is mounted at ground level and driven from the chain sprocket appearing at the side of the portable unit

Máquina de limpieza y reparación de pozo, montada en neumáticos. La caldera se acciona con un malacate de bomba de arena, el cual está montado al nivel piso y propulsado por la rueda dentada de cadena que se ve al lado de la unidad portátil

Fig. 511

Fig. 516

Fig. 505

Fig. 517

SPANG

CABLE TOOLS

SPANG AND COMPANY
Butler, Pa., U. S. A.

Fig. 526

Fig. 618

Fig. 654

Fig. 671

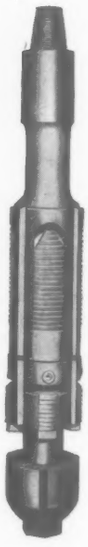


Fig. 693-A

Fig. 677

Fig. 683

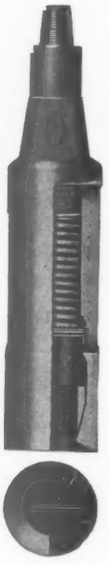


Fig. 620

Fig. 706

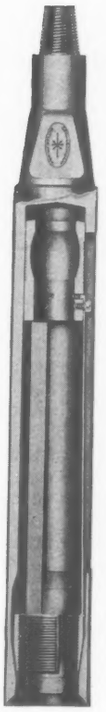


Fig. 626

Fig. 524

Fig. 511—Spang Weldless Drilling and Fishing Jars . . . forged from one piece of alloy steel.

Fig. 516 & 517—Heat-Treated Pin and Box for Stems and Sinkers.

Fig. 505—Prosser-Type Swivel Rope Socket.

Fig. 526—Standard-Type Straight-Blade, All-Steel Drilling Bit, with heat-treated pins.

Fig. 524—Spang-Type Drilling Bit, Twisted Blade . . . most effective drilling bit available, for all formations. Insures straighter holes, lessens caving.

Fig. 618—Spang Patented Alligator Grab.

Fig. 654—Manila-Rope or Wire-Line Grab, made with either 2 or 3 prongs.

Fig. 671—Spang Eclipse Up-Cutting Wire-Line Knife.

Fig. 693-A—Trip-Casing Spear . . . made in 2, 3 and 4 Slip Types.

Fig. 677—Improved-Type Casing Cutter.

Fig. 683—Spang Patented Reversible Splitter or Ripper.

Fig. 620—Combination Socket.

Fig. 706—Combination Trap Slip Socket, for fishing tubing and rods.

Fig. 626—Full-Circle Three-Slip Socket.

For more than 40 years, Spang Drilling and Fishing Tools have been universally recognized as "Higher Standard" Cable Tools. Their reliability and economy have been proved in the drilling of thousands of the most difficult wells. Today, Spang and Company are the largest exclusive manufacturers of Cable Tools in the world. The Spang line includes the various tools required for all Cable Drilling conditions and for general lease maintenance. Catalog on request.

Fig. 511—Recipientes sin soldadura Spang de perforación y de pesca, forjados de especial aleación de acero de una sola pieza.

Fig. 516 & 517—Espiga y cojinete tratados térmicamente para vástago by dispositivos forzadores.

Fig. 505—Manguito de cable giratorio tipo Prosser.

Fig. 526—Barrena de perforación de tipo Spang, de lámina recta normal, con espigas tratadas termicamente.

Fig. 524—Barrena de perforación de tipo Spang, de lámina en espiral. La broca o barrena más eficaz en el mercado, para todas las formaciones. Asegura agujeros más rectos y reduce los hundimientos.

Fig. 618—Atrapador Alligator Spang patentado.

Fig. 654—Atrapador en cable metálico o de Manila, con 2 o con 3 puntas.

Fig. 671—Cuchilla Eclipse Spang para cortar cable metálico de abajo para rriba.

Fig. 693-A—Harpón de disparo de revestimiento, provisto en tipos de 2, 3 o 4 sujetadores.

Fig. 677—Fresa de revestimiento de tipo perfeccionado.

Fig. 683—Seccionador o rompedor reversible Spang patentado.

Fig. 620—Manguito de combinación.

Fig. 706—Manguito de combinación de sujetador y trampa, para pesar la tubería y varillaje.

Fig. 626—Manguito de tres sujetadores a círculo completo.

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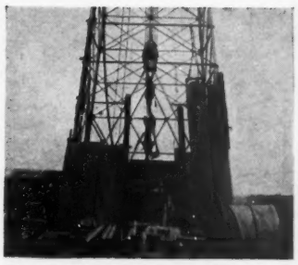

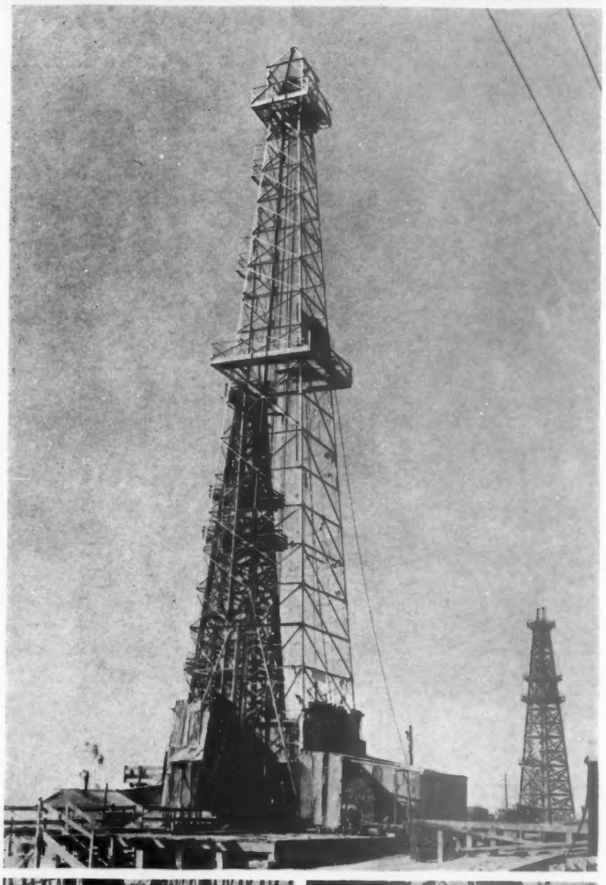

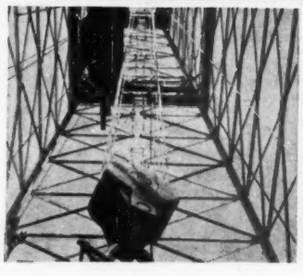

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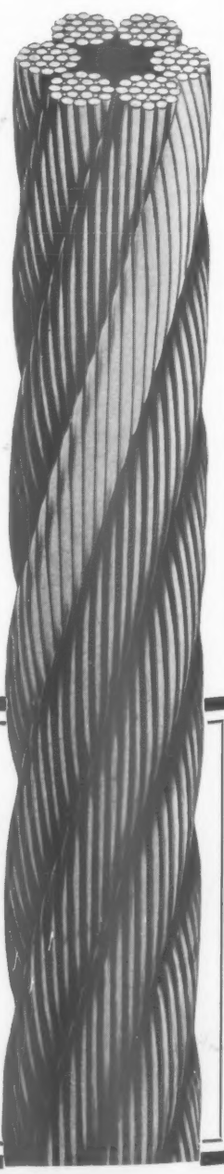

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Distributor and Factory Warehouse Stocks in All Principal Oil Fields

(Continued from Page 201)

mitters described above, it became desirable in many cases to exercise more positive control from the surface over the opening and closing of the bottom-hole valve. Two systems have been developed in which wire lines are used to provide remote control for the intermitter valve. In one system ball valves are located in the tubing string so that the balls project slightly inside of the inner periphery of the tubing. A weight bar on a wire line is used to force the valve balls from their seats so that gas will be admitted into the tubing.

Another type of positive-controlled bottom-hole intermitter is the hydraulic intermitter. The medium of control from the surface to the bottom-hole intermitter is established by a dead fluid column extending the entire distance.

Other surface-controlled bottom-hole intermitters have been used in which gas passages at the bottom of the tubing are opened and closed either by raising and lowering the tubing or by rotating the tubing through the use of a small electric motor. In each case gas pressure is applied steadily to the casing and is admitted to the tubing as the ports are opened at predetermined intervals.

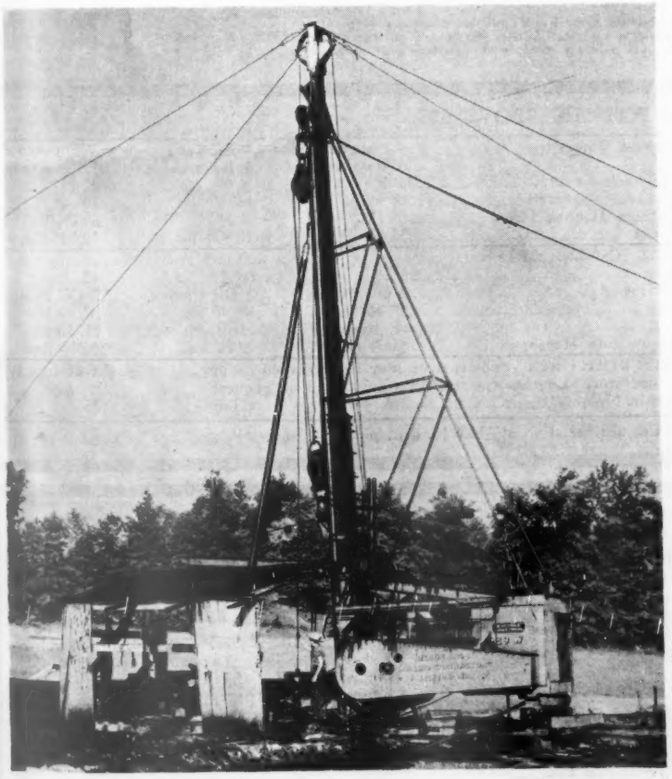
Flowing Wells

In conjunction with the pressure-maintenance program in the K.M.A. field of North Texas, some operators have adopted production rates for their flowing wells that require the lowest possible volume of gas to produce a barrel of oil. While this appears to be the obvious way to regulate the flow of wells, since it will conserve reservoir pressure, it has not always been followed, nor is it followed universally at present. Unfortunately, it is often assumed that a low rate of flow will lead inevitably toward greater flowing recovery, and also toward greater ultimate recovery from the oil pool. Actually, a low rate of flow can be, and usually is, more wasteful of reservoir pressure than open flow. While open flow is not to be recommended, it is to be preferred in some respects over too severe restriction which tends to bleed off an abnormally high proportion of gas, leaving "dead" oil in the reservoir.

Rate of Flow Versus Gas-Oil Ratio

Given sufficient time in a pool in which the oil is saturated with gas, it would be possible to bleed off most of the dissolved gas without producing any oil, provided that sufficiently small choke openings were used at the well heads. An everyday equivalent of this is seen in the case of the ginger ale or charged-water bottle. A small leak in the cap or valve will permit all of the dissolved carbon dioxide to escape, leaving the bottle full of lifeless fluid. When large-capacity flowing wells are pinched back with surface chokes so that they will produce only 5 or 6 bbl. per hour, then the above most wasteful condition is being closely approached. Velocity of flow is so low that the tubing acts as an oil-and-gas separator.

Flowing rates need not be governed by the daily allowable produc-



A portable spudder at work in an Illinois field on a deepening job

Una perforadora inicial portátil profundizando un pozo en un campo de Illinois

(Continue desde Pagina 201)

El grupo quitable está sujeto por tazas, las cuales se extienden cuando quedan sometidas a la presión del gas entrante.

Intermetidores de agujero de fondo de gobierno exterior

Muchos de los más recientes sistemas de presión intermitente de gas usan un intermetidor en el agujero del fondo, que es gobernado desde la superficie, con la ayuda de algún medio positivo. Debemos recordar que en los originales sistemas de intermetidores, la válvula que regula la corriente del gas por el intermetidor estaba colocada en la tubería del gas, en la superficie, y por esta razón, los gobiernos de esta válvula y el dispositivo de distribución, estaban colocadas también en la superficie. A pesar de que este sistema original conserva el gas, en la mayor parte de los casos, en comparación con la presión directa del gas, los intermetidores de agujero de fondo fueron desarrollados para hacer innecesario el llenar la tubería de producción con gas de alta presión en cada período de corriente. Aunque esto fué realizado por los intermetidores automáticos de agujero de fondo, descritos arriba, se hizo conveniente, en muchos casos, ejercer un gobierno más positivo desde la superficie, sobre la abertura y el cierre de la válvula del agujero de fondo. Se han desarrollado dos sistemas, en los cuales se usan cables de alambres para establecer un gobierno a distancia de la válvula del intermetidor. En un sistema hay válvulas esféricas colocadas en el entubamiento, las cuales se proyectan un poco dentro del interior de la periferia. Una barra de peso o un cable alambre se usa para desalojar las válvulas esféricas de sus asientos, para permitir la entrada del gas al entubamiento.

Otro tipo de intermetidor de agujero de fondo de gobierno positivo es el modelo hidráulico. El medio de gobierno de la superficie al intermetidor de agujero de fondo se establece por una columna inerte de flúido que se extiende a toda la distancia.

Se han usado también otros tipos de intermetidores de agujero de fondo, accionados desde la superficie, en los cuales los conductos del gas al fondo del entubamiento se abren y cierran levantando y bajando el entubamiento o girándolo con la ayuda de un pequeño motor eléctrico. En cada caso, el presión del gas se aplica contínuamente a la tubería y es admitida al entubamiento cuando se abren los orificios a intervalos predeterminados.

Pozos brotantes

En conjunción con el programa de mantenimiento de presión en el campo K.M.A. en el norte de Texas, algunos explotadores han adoptados regímenes de producción para sus pozos brotantes, que requieren la menor cantidad posible de gas para la producción de un barril de petróleo. Aunque esto parece ser la manera racional de regular la producción de los pozos, a causa de que conserva la presión del yacimiento, no siempre se ha seguido y tampoco es seguida universalmente hoy en día. Por desgracia se asume, a menudo, que un bajo régimen de emanación conducirá inevitablemente a una mayor recuperación de corriente y también a una mayor recuperación del yacimiento de petróleo. En realidad, un bajo régimen de salida puede ser, y generalmente es más derrochador de presión de yacimiento que una corriente libre. Aunque no se recomienda una salida o corriente libre, ella as preferible, en ciertos respectos, a una restricción demasiado severa, que tiende a expulsar una proporción anormalmente alta de gas, dejando petróleo "inerte" en ei yamiento.

Regimen de corriente y relacion de gas y petróleo

Dado suficiente tiempo en un yacimiento en que el aceite está saturado de gas, sería posible expulsar casi todo el gas disuelto, sin producir ningún petróleo, siempre que se usaran orificios reductores o de estrangulación suficientemente pequeños en los cabezales de los pozos. Un equivalente a esto lo vemos a diario en el caso de una botella de ginger ale o de agua carbonatada. Un pequeño escape en la tapa o la válvula permitirá que se escape todo el bióxido de carbono disuelto, dejando el líquido "inerte." Cuando los pozos de gran capacidad brotante se restringen mediante reductores en la superficie, para que produzcan sólo 5 o 6 barriles por hora, se presenta aquí una repetición de lo que acabamos de decir. La velocidad de la corriente es tan baja que el entubamiento actúa como un separador de petróleo y gas.

Las velocidades de corriente no necesitan regularse por la producción diaria permitida. Cuando las producciones diarias permitidas son bajas, los pozos brotantes deberían entonces explotarse durante unas pocas horas al día, a fin de que trabajaran a los más favorables régimenes o velocidades de emanación. Cerra el pozo cierto número de horas al día es, por lo general, más conveniente que dejarlo brotar continuamente a un régimen derrochador de producción.

Objeciones a la producción intermitente

Lo antedicho ha revelado ventajas en la explotación de pozos brotantes sobre la base de corriente o producción intermitente. Sin embargo, se dice a veces que la producción intermitente de pos pozos brotantes no es conveniente, avanzándose dos argumentos para sostener esta contención. La primera queja es durante los períodos de para se permite que el gas se acumule en la parte superior del entubamiento, y que esta acumulación ha de descargarse como desperdicio antes de que el petróleo empiece a salir de nuevo. El gas des-

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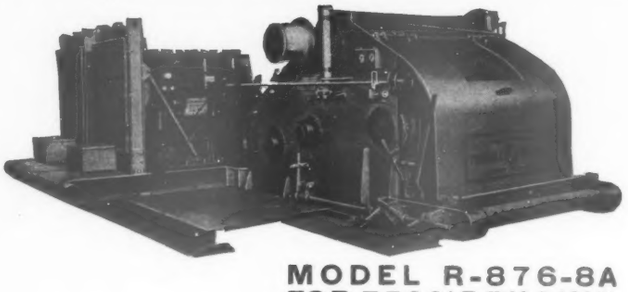

MODEL 35 FOR 3000′ DRILLING

Showing draw works with single engine drive (dual engine drive can be furnished). Rig can be mounted on sub-structure of any desired height, or mounted on truck for well servicing and drilling where moves are frequent.

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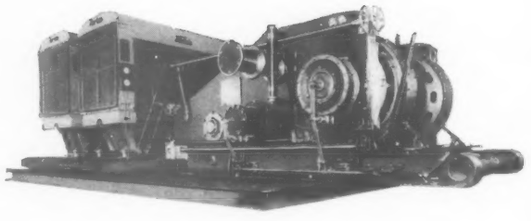
MODELO 35 PARA PERFORACION DE 3000 PIES

Mostramos aquí el aparejo de maniobras o torno de extracción con un solo motor. Podemos suministrarlo también con propulsión por dos motores. El aparejo de perforación puede montarse en subestructura de cualquiera altura deseada, o montarse en camión para servicio y perforación de pozos, donde son frecuentes las mudanzas.



MODEL R-876-8A FOR 7500′ DRILLING

Side view showing accessible controls at driller's position. Features: 8 speeds forward, six speeds reverse on drum, rotary shaft and sand reel; (Enclosed sand reel optional); Dual engine drive; heavy-duty friction clutches on drum and rotary shafts; air-controlled engine clutches; force-feed lubrication.

●

MODELO R-876-8A PARA PERFORACION DE 7500 PIES

Vista lateral, en que se muestran los gobiernos al fácil alcance del empleado a cargo de la perforación. Rasgos: 8 velocidades hacia adelante, seis en retromarcha en el tambor, árbol giratorio y malacate de bomba de arena; (malacate de bomba de arena cubierto, a elección); propulsión por doble motor; embragues de trabajo pesado en el tambor y árboles giratorios; embragues de motor regulados por aire; lubricación de alimentación a presión.

MODEL CT-5 FOR 6000′ DRILLING

Showing dual engine drive and controls centralized at driller's position. Other features: 5 speeds to drum and 4 speeds to rotary; large diameter shafting; heat-treated cut tooth steel sprockets, hydraulic control of clutches, force-feed lubrication.

MODELO CT-5 PARA PERFORACION DE 6000 PIES

Mostramos aquí la propulsión por doble motor y los gobiernos centralizados al fácil alcance del operario. Otros detalles: 5 velocidades al tambor y 4 velocidades a la rotativa; árboles de gran diámetro; ruedas dentadas de acero tratado termicamente; gobierno hidráulico para los embragues; lubricación de alimentación a presión.

GENERAL SPECIFICATIONS FOR THE ABOVE RIGS

	R-8/6-8A	CT-5	35
Depth Recommended	7.500′	6.000′	3.000′
DRAW WORKS			
Drum Shaft	7⅝″	6½″	4¾″
Line Shaft	5″	4½″	3½″
Rotary Shaft	4½″	4¾″	3½″
Brakes—Type	Water Cooled	Water Cooled (Optional)	Conventional
Brake Width	10″	9¾″	8″
Brake Drum Diameter	40″	40″	36″
Drum Spool Dimension	18″x30″	18″x30″	16″x26″
Drum Clutches	Friction	Friction	Friction
Speed on Drum	8 Forward	5 Forward	3 Forward
	6 Reverse	3 Reverse	1 Reverse
Rotary Clutch	Friction	Friction	Friction

Speed on Rotary	8 Forward	4 Forward	3 Forward
	6 Reverse	3 Reverse	1 Reverse
Rig Height—overall	6′ 9″	5′ 0″	4′ 7½″
Rig Length—overall	14′ 6″	13′ 0″	10′ 0″
Width on Derrick Floor	6′ 11″	6′ 7½″	5′ 1½″
Weight	25.000 lbs.	18.000 lbs.	10.000 lbs.
DUAL ENGINE DRIVE:			
Shafts	5 7/16″	5 7/16″	4″
Lubrication	2 Oil Pumps	2 Oil Pumps	2 Oil Pumps
Skids	8″ 40 lb.	8″ 40 lb.	8″ 40 lb.
	H. Beam	H. Beam	H. Beam
Approximate Weight	8.000 lbs.	7.000 lbs.	4.200 lbs.
SUBSTRUCTURE: Substructure may be furnished on any rig at height desired by operator. Engines specifications submitted on request.			
Bulletin Number	876	CT-5	35

NOTE: Pump Drives vary with make and size of pump and engine speed. All capacities are based on 4½-16.6 lb. drill pipe with tool joints.

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tion. When allowables are low, the flowing wells should be produced for only a few hours per day so that they are able to make their production at their most favored rates of flow. Shutting the well in for part of the day is usually far more desirable than flowing it continuously at a wasteful production rate.

Objections to Intermittent Flow

Occasionally it may be contended that intermittent production of flowing wells is undesirable, two arguments being advanced for this contention. The first complaint is that during the shutdown periods gas is allowed to accumulate at the top of the tubing, and this must be discharged as waste before flow of oil is started. Gas discharged in this manner has been measured and its volume was found to be inconsequential.

The second complaint against intermittent production is that it promotes caving of the oil sands and intervening shales. Without doubt this complaint is sometimes well founded in regard to flow rates of several hundred barrels per hour, but for gas-oil ratio control the flow rate need not exceed 30 bbl. per hour when 2½-in. tubing is used, and it is doubted that such a rate will injure any producing sand.

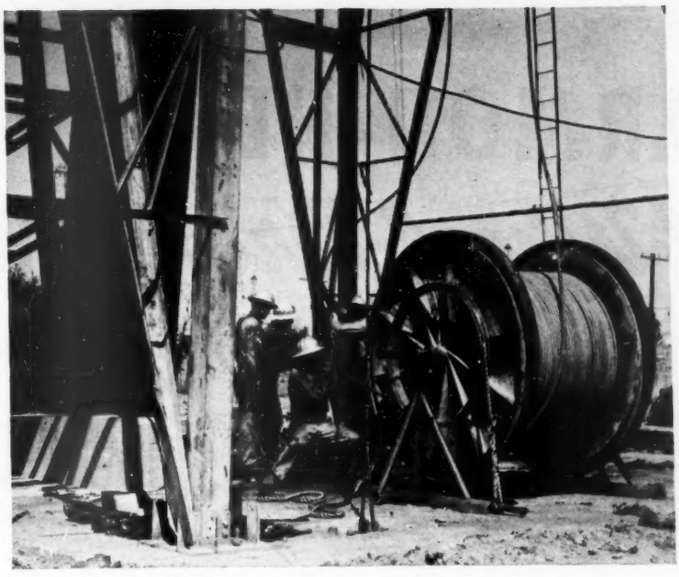
Tubing Strings

Most flowing wells are equipped with 2½-in. tubing because this size is most likely to be wanted when pumping or gas lift is inaugurated. Smaller tubing is known to be advantageous in flowing wells of low allowable, but it is usually considered uneconomical to install a flow string that will have to be replaced when flow ceases. If a "macaroni" string is used inside of the tubing, the flow can be reduced to a much lower rate without causing an increase in gas-oil ratio due to oil and gas separation in the string.

Tapered tubing strings are theoretically beneficial for use in flowing wells. Since gas expands as it rises with the oil toward the surface, the flow string should be larger at the top if the same velocity of flow is to be maintained throughout the string.

A bottom-hole choke brings about improved flowing conditions because it causes the gas to expand rapidly at the bottom of the tubing, thus increasing the flowing velocity in the lower portion of the string. The higher velocity reduces slippage, thereby increasing the efficiency of flow. Also, since oil is lifted by gas expansion, efficiency of flow is increased because of the fact that the gas is more fully expanded when it reaches the surface. When only a surface choke is used, a considerable part of the expansion occurs at the well head where it cannot take part in lifting the oil. The magnitude of this energy loss increases as the flowing back-pressure increases.

In reservoirs that contain free gas, the tubing is set as deep as possible in the flowing wells, as this practice aids in maintaining a low gas-oil ratio.



Equipping a deep well with a submergible centrifugal pump. Note rope-and-wheel device for keeping electric-power cable taut while tubing is being run

Equipando un pozo profundo con una bomba centrifuga sumergible. Tome nota del dispositivo de cuerda y rueda, para mantener tieso el cable de la fuerza eléctrica mientras se está bajando la tubería

Conclusions

The flow of oil and gas in reservoirs and tubing is a complicated study. Yet, if a few simple facts are given due consideration, flowing wells can be operated efficiently without evaluation of the complicated and controversial aspects of flow.

For determining the best rate of flow for a given well, there is no substitute for gas-oil-ratio tests. These tests should be made at enough different rates of flow to establish an accurate curve from which the most efficient flowing rate can be selected. Great care must be exercised in measuring the gas at low flow rates as the volume of gas is small and an error will give a misleading gas-oil ratio.

For wells that use 2-in. tubing the need for flow regulation is not so great. Nevertheless, material assembled shows that wasteful conditions usually occur in pools where the oil is saturated with gas when rate of flow is restricted below 10 bbl. per hour. The optimum flow appears to be in the neighborhood of 15 bbl. per hour.

For 2½-in. tubing, wasteful flow usually takes place when the flow rate is reduced below 25 bbl. per hour and the optimum flow rate appears to be in the neighborhood of 40 bbl. per hour for pools in which the oil is saturated with gas.

Vapor-Phase Cooling

High-temperature engine cooling has progressed into its early commercial life. When it becomes better established it will probably be con-

(Continued on Page 211)

cargado de esta manera se ha medido y se ha visto que su cantidad as insignificante.

La segundo queja contra la producción intermitente es que promueve derrumbamiento de las arenas petrolíferas y esquistos intermediarios. Sin duda alguna, esta queja a veces tiene buena base, al tratarse de velocidades de corriente de varios centenares de barriles por hora, pero, para para el gobierno de la relación de gas y petróleo, el régimen de corriente no necesita pasar de 30 barriles por hora, cuando se usa un entubamiento de 2½ pulgadas, y es muy dudoso de que semejante régimen pueda causar daño a la arena productura.

Tubos Cónocos

Casi todos los pozos brotantes están provistos de entubamiento de 2½ pulgadas, debido a que este tamaño es el que se necesitará para la iniciación de la extracción del petróleo y presión de gas. Se sabe que la tubería de menor diámetro es ventajosa en pozos brotantes de producción regulada a bajo rendimiento, pero se considera generalmente que no es económico instalar un entubamiento que tendrá que reponerse cuando cese el brotamiento. Al usarse una sección llamada "macaroni" dentro del entubamiento, se puede reducir la corriente a un menor régimen o velocidad, sin causar un aumento en la relación de gas y petróleo, debido a la separación del petróleo del gas en el entubamiento.

Las series de tubos cónicos son en teoría beneficiosos para los pozos brotantes. Como el gas se dilata al levantarse con el petróleo hacia la superficie, la serie de tubos de corriente deberá ser más grande en la parte de arriba para mantener la misma velocidad de emanación o salida en toda la tubería.

Un reductor de agujero de fondo produce mejores condiciones de flujo o corriente a causa de que facilita la rápida dilatación del gas el fondo del entubamiento, aumentando así la velocidad de la corriente en la parte inferior de la tubería. La mayor velocidad reduce las interrupciones, aumentando así la seguridad de la corriente. Por otra parte, como el petróleo es levantado por la dilatación del gas, se aumenta el rendimiento de la corriente debido al hecho de que el gas se encuentra más completamente dilatada cuando llega a la superficie. Cuando se usa sólo un reductor o estrangulador de superficie, una considerable parte de la dilatación del gas ocurre en el cabezal del pozo, donde no puede tomar parte en el levantamiento del petróleo. La magnitud de esta pérdida de energía aumenta con el incremento de la contrapresión de la corriente.

En yacimientos que continenen gas libre, el entubamiento se coloca a la mayor profundidad posible en los pozos brotantes, pues esta práctica ayuda a mantener la relación de gas y petróleo en un grando moderado.

Conclusiones

El flujo o corriente de petróleo y gas en los yacimientos y la tubería representa un estudio muy complicado. Sin embargo, si ciertos sencillos hechos reciben debida consideración, los pozos brotantes podrán explotarse lucrativamente, sin tener que preocuparse del estudio de los complicados aspectos del flujo o corriente.

Para determinar el mejor régimen de producción de un pozo dado, no hay substitutos para los ensayos de la relación de gas y petróleo. Estos ensayos deben hacerse a diferentes régimenes de extracción o corriente, para establecer una curva extacta en vista de la cual pueda determinarse el régimen de salida más eficaz. Debe darse mucho cuidado a la medición del gas a bajas velocidades de salida, pues la cantidad de gas es pequeña y un error aquí dará una relación equivocada de gas y petróleo.

Para los pozos con tubería de 2 pulgadas, la necesidad de regular la salida o corriente no es tan grande. Sin embargo, el material recopilado muestra que las condiciones de des perdicio ocurren generalmente en yacimientos donde el petróleo está saturado de gas cuando el régimen de corriente o salida se limita a menos de 10 barriles por hora. El régimen óptimo de salida parece ser alrededor de 15 barriles por hora.

Para tubería de 2½ pulgadas, el derroche en la salida se presenta cuando el régimen se reduce a menos de 25 barriles por hora. El régimen ópitmo parece que en este caso queda alrededor de 40 barriles por hora en los yacimientos en que el petróleo está saturado de gas.

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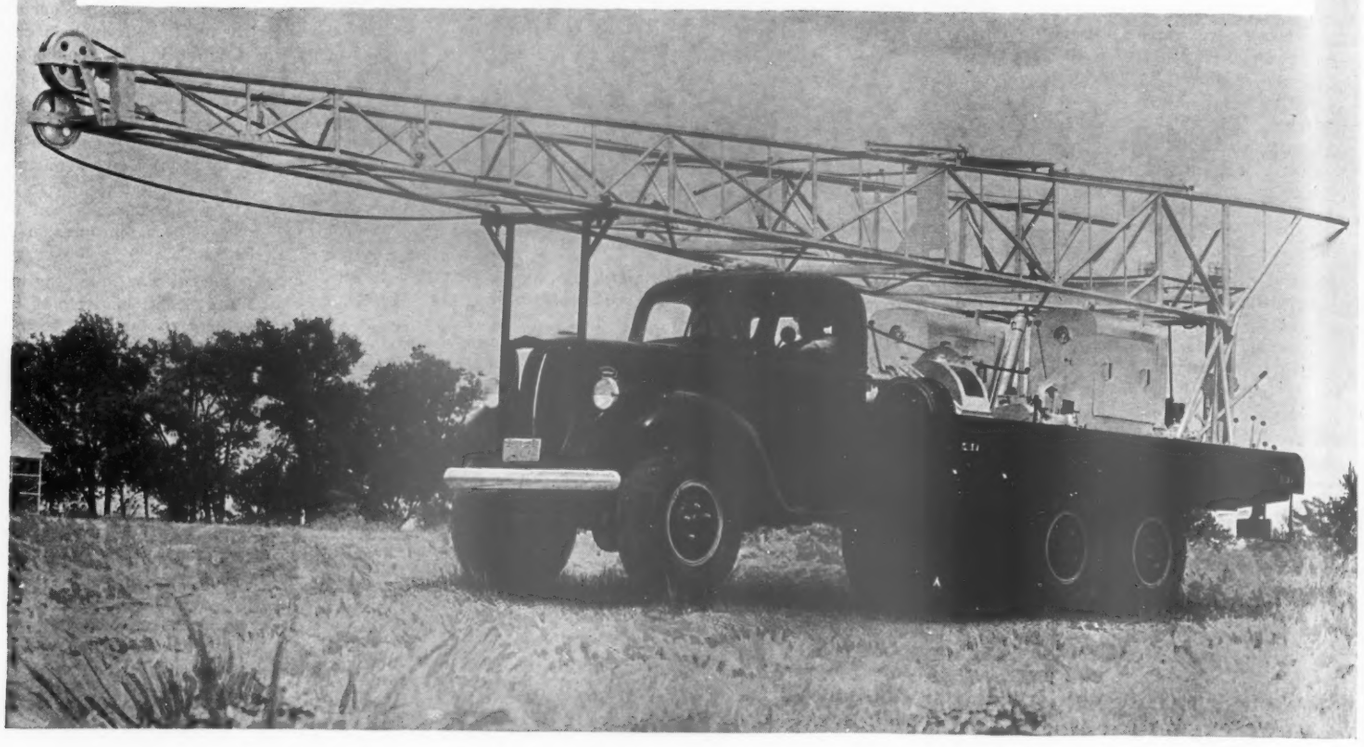

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(Continued from Page 207)

sidered the greatest stride in internal-combustion-engine progress in many years. In simplest terms it consists in supplying water to the engine jacket at or near the boiling point so that after the water emerges from the block, a slight decrease in pressure will cause the waste heat to be liberated in the form of steam. This steam is condensed in a radiator or heat exchanger so that the condensate can be pumped back into the system. By forcing the fluid through the jacket at a rapid rate hot spots are avoided and a more uniform temperature is maintained over the lengths of the cylinders.

When experimental work first began with vapor-phase cooling it was noted that although the water was supplied to the engine block at a much higher temperature than in the conventional cooling system, oil temperatures in the crankcase were appreciably lower. For some time explanations for this phenomenon were lacking, and the theory was advanced that this lowering of the crankcase temperature was the result of reducing the mechanical losses in the engine through decrease in oil drag. Later a search through heat-exchange data disclosed the fact, well known in some quarters, that the rate of heat transfer from steel to water increases as the temperature of the water increases. In the case of engines this increase in the rate of heat transfer is more than enough to compensate for the decreased temperature differential between the metal and the water. Therefore, although the water is supplied to the block at a higher temperature, it absorbs heat faster.

Explanation for the ability of hot water to absorb heat faster than cold water appears to lie in the fact that the film strength or surface tension of the water is weakened with heating. A practical application of this fact is seen in the tempering of steel. In order to bring about the most rapid cooling, the steel is dropped into water at the boiling point rather than into cold water.

In their article published in The Oil and Gas Journal, September 7, 1939, Page 58, J. H. Wallace and R. A. Newton showed that the upper ends of the cylinder jackets in an internal-combustion engine are always at boiling temperature while in operation regardless of the temperature of the circulating water. In other words, it is impossible to cool the tops of the cylinder liners with water without having boiling take place on the outer surfaces of these liners. Therefore, in order to reduce the temperature gradient between the upper and lower ends of the liners, it is necessary to increase the temperature at the lower ends rather than to attempt to reduce the temperature at the head.

Condensation on Cylinder Walls

Combustion of hydrocarbons in an engine cylinder produces carbon dioxide, carbon monoxide, water, and some small portion of sulfur dioxide. The quantity of water formed is surprisingly great, amounting to about 1 gal. per 10 b.hp.-hr. Most of this passes through the exhaust valve as steam, but if the lower portion of the cylinder is below the dew point of water some steam will condense upon the cylinder wall.

Moisture condensing on the cylinder wall will quickly absorb sulfur compounds from the products of combustion, since sulfur dioxide will combine readily with water to form sulfurous acid. When the rising piston scrapes the condensate off the cylinder wall, water mingles with the oil film. The acid attacks walls, pistons, and rings, and also acts as an emulsifying agent to form a sludge which accumulates in the crankcase and builds up a thick gummy deposit on rings and pistons.

The greatest benefit derived from vapor-phase cooling comes as the result of raising the wall temperatures in the lower portion of the cylinders to a point where condensation is avoided. In several modern installations internal-combustion engines with this type of cooling are now operated on sewer gas or sour nat-

Enfriamiento de motor en fase de vapor

(Continue desde en Page 207)

El enfriamiento de motor de alta temperatura ha progresado a su primera utilización comercial. Cuando se establezca mejor, se considerará probablemente el paso más grande dado en muchos años en en beneficio del progreso del motor de explosión interna. En los términos más sencillos, consiste en suministrar agua a la canalización o camisa del motor, a punto de ebullición o cerca de éste, de modo que a la salida del agua del bloque de cilindros, una leve caida de presión hará que el calor de escape salga en la forma de vapor. Este vapor es condensado en un radiador o cambiador de calor, y el líquido se inyecta de nuevo en el sistema. Forzando el líquido por la canalización a una alta velocidad, se eliminan los puntos candentes y se mantiene una temperatura más uniforme a la longitud total de los cilindros.

Durante los primeros experimentos con el enfriamiento en fase de vapor, se observó que, a pesar de suministrarse el agua al bloque de cilindros a una temperatura mucho mayor que en el sistema corriente de enfriamiento, las temperaturas del aceite en la caja del cigüeñal eran considerablemente más bajas. Durante algún tiempo, no se pudo explicar este fenómeno, y se avanzó entonces la teoría de que esta bajada en la temperatura de la caja del cigüeñal era el resultado de reducir las pérdidas mecánicas en el motor gracias a una disminución en al arrastre del aceite. Más tarde, un estudio de datos relativos al cambio de calor, descubrió el hecho, bien conocido en ciertas partes, que la velocidad de la transferencia de calor del acero al agua aumenta a medida que sube la temperatura del agua. En el caso de motores, este aumento en la velocidad de la transferencia del calor es más que suficiente para compensar el diferencial de temperatura reducido entre el metal y el agua. Por esta razón, a pesar de que el agua es suministrada al bloque be cilindros a una mayor temperatura, ella absorbe el calor con mayor rapidez.

La explicación de la facultad del agua caliente para absorber calor con mayor rapidez que el agua fría parece que se encuentra en el hecho de que la firmeza de la película o tensión de superficie del agua se debilita con el calor. Una aplicación práctica de este hecho lo tenemos en el temple del acero. Para producir el más rápido enfriamiento, el acero se sumerge en agua a punto de ebullición, en lugar de agua fría.

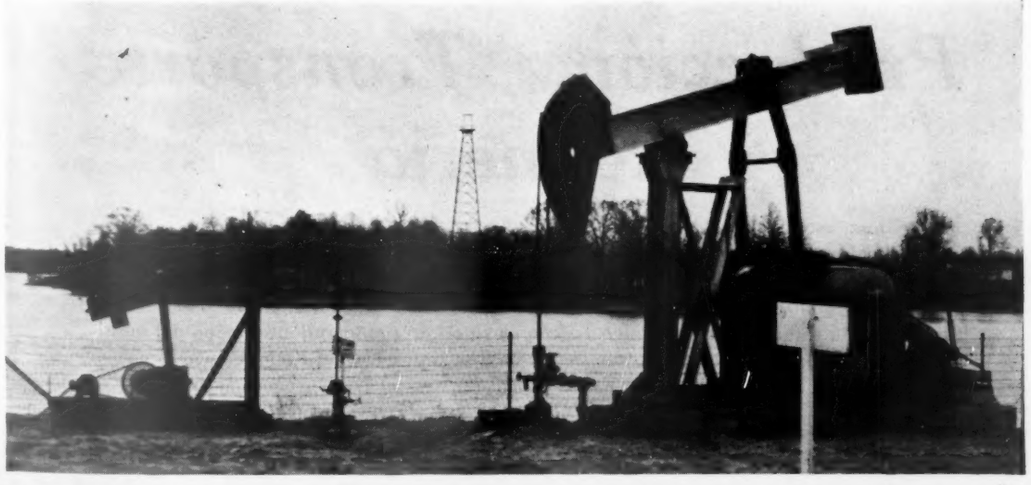
En su artículo publicado en The Oil and Gas Journal, del 7 de septiembre de 1939, página 58, los Srs. J. H. Wallace y R. A. Newton mostraron que los extremos superiores de las canalizaciones o camisas de los cilindros de un motor de explosión interna están siempre a una temperatura de ebullición, mientras están funcionando, independientemente de la temperatura del agua de circulación. En otras palabras, es imposible enfriar las partes superiores o topes de los manguitos de los cilindros, con agua, sin que haya ebullición en las superficies exteriores de estos manguitos. Por esta razón, para reducir la temperatura intermedia entre los extremos superiores e inferiores de los manguitos o forros de los cilindros, es necesario aumentar la temperatura de los extremos inferiores, en lugar de tratar de reducir la temperatura en los extremos superiores.

Condensación en la pared del cilindro

La combustión de los hidrocarburos en el cilindro de un motor produce bióxido de carbono, monóxido, agua y cierta pequeña porción de bióxido de azufre. La cantidad de agua formada es sorprendentemente grande, llegando a como 1 galón por 10 horas de caballo de fuerza. Casi toda esta agua sale por el escape en la forma de vapor, pero si la parte inferior del cilindro está debajo del punto de humedad del agua, parte del vapor se condensará en la pared del cilindro.

La humedad que se condensa sobre la pared cilindro rapidamente absorberá óxidos de azufre que resultan de la combustión, pues el bióxido de azufre se combina facilmente con el agua formando ácido sulfúrico. Cuando el émbolo, en su subida, barre el condensado de la pared del cilindro, el agua se mezcla entonces con la película de aceite. El ácido ataca a la pared del cilindro, émbolos, anillos y actúa también como agente de emulsificación para formar cieno, que se acumula en la caja del cigüeñal, desarrollando aquí depósitos gomosos espesos que se extienden a los anillos y los émbolos.

El mayor beneficio derivado del enfriamiento en fase de vapor viene como el resultado de aumentar las temperaturas de la pared, en la porción inferior de los cilindros, a un punto en que se evita la condensación. En varias modernas instalaciones, hay motores de explosión interna con este tipo de enfriami-



Twin wells at Lake Centralia, Illinois, producing from two different sands. Equipment sizes necessary for each well have been calculated from well conditions

Dos pozos gemelos en el Lago Centralia, Illinois, que producen de dos diderentes formaciones arenosas. Los tamaños del equipo necesario para cada pozos se han calculado de acuerdo con las condiciones de los pozos

Compresor Worthington LTC con motor de gas, de tipo angular, ofrecido en seis tamaños, de 375 a 1000 cdf.

Tres compresores de 225 cdf. y dos compresores de 300 cdf. Worthington, con motores de gas de tipo angular, en una refinería de destilación por cracking.

Uno de los dos motores Worthington de 8 cilindros, de 1000 cdf. de tipo convertible de gas a Diésel, en servicio general de fuerza.

Motor de gas Worthington, tipo vertical, de 180 cdf. para servicio auxiliar, en una estación de líneas de tubería de petróleo, en la parte central del o este.

Bomba centrífuga de carga caliente Worthington, accionada por un motor de gas Worthington, de tipo vertical, en una refinería del este.

Dos bombas centrífugas Worthington, de tipo H, para el manejo de petróleo caliente, en una instalación de reciclación.

Una de los tres bombas duplex Worthington, accionadas por motor, para bombar petróleo frío, a una presión de decarga de 1500 p.s.i.

Dos bombas centrífugas Worthington, de líneas de tubería de petróleo, accionadas, a través de pared contra incendio, por motores Diésel Worthington de 280 cdf.

Máquinas enfriadoras Worthington-Carbondale, para la directa expansión o dilatación del amoniaco, en una instalación de desparalinación por solvente.

Compresor Worthington, de tipo angular, para la refrigeración, con cilindros de amoniaco, en una instalación de desparafinación.

Bombas mecánicas duplex Worthington, de tipo horizontal, en un servicio de represión con agua.

Sistemas de descoquificación hidráulica, para la extracción y transporte del coque de las cámaras en las refinerías.

Bomba giratoria Worthington, accionada por motor de gasolina, en líneas alimentadoras en los campos petrolíferos.

Bombas Worthington HiVol, de acción directa, manejando gasolina en servicio de refinería.

Bombas centrífugas Worthington, en líneas, accionadas por turbinas de vapor Moore, en servicio de refinería de petróleo.

Bomba mecánica Worthington, accionada por motor de gasolina, con transmisión Worthington Multi-V, en servicio de líneas alimentadoras.

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MOTORES CONVERTIBLES DE GAS A DIESEL
TURBINAS DE VAPOR MOORE
ENGRANAJES DE CAMBIO DE VELOCIDAD
EQUIPO DE REFRIGERACION
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BOMBAS CENTRIFUGAS PARA TODO USO
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Producción · Transporte Refinería

LAS instalaciones ilustradas aquí ponen de manifiesto el completo dominio que la Worthington tiene sobre el equipo de fuerza motriz y de bomba para campos petrolíferos, líneas de tubería de petróleo y refinerías . . . para todo requisito o exigencia de trabajo. Una creciente lista de instalaciones Worthington . . . para toda función de la industria del petróleo . . . no es sino un reconocimiento lógico del contínuo y eficaz funcionamiento de sus productos en todas las aplicaciones a que se someten.

WORTHINGTON PUMP AND MACHINERY CORPORATION

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WORTHINGTON

ural gas, both of which contain comparatively large portions of hydrogen sulfide. Even with fuel of this type sludge formation is reduced to an almost inconsequential amount. Since practically all motor fuels contain an appreciable quantity of sulfur compounds, operation on sour gas represents only an acceleration of the deteriorating influences at work in the average engine. An automobile equipped for vapor-phase cooling has been driven 25,000 miles without changing either the oil or the oil filter. The oil is still clear, save for a small accumulation of carbon particles.

Vapor-phase cooling can increase engine efficiency 3 or 4 per cent under full load or up to 8 or 10 per cent under partial load.

Stripper Lease Operation

In the operation of stripper leases the most noteworthy development of the past year has been the introduction of a device which will disconnect each well from the central power automatically when it has completed its daily production. The most time-consuming routine task for the pumper on a stripper lease consists of shutting down wells after they have pumped off. While the operation itself is simple, the necessity of being on hand at the time each well completes its daily pumping period usually makes it impossible for the pumper to engage effectively in constructive work about the lease. In many cases these frequent interruptions prevent him from giving the equipment its proper maintenance care.

Determining When to Shut Down Wells

Much of the pumper's time is spent in determining when the well has pumped down to a point where it is desirable to shut down. Opinion varies as to when this point is reached, with some contending that the well should be shut down as soon as it begins to pound fluid, while others believe that it is best to continue pumping long after the fluid pound has developed so that the maximum production will be obtained. Leaving this controversy for the moment, fluid pound is caused by incomplete filling of the barrel which causes the plunger and rods to fall rapidly on the downstroke until the plunger strikes the fluid.

This surface effect of the pump-off is utilized in the automatic shut-down device. The pumper's foot is replaced by a cast-iron weight which induces the sagging in the rod line. When absence of fluid in the barrel causes the line to become taut on the downstroke, this tension raises the weight to a position where it will strike a hinged finger which protrudes downward from a sliding rod placed above the rod line. Through this contact the upper rod is forced back, causing the release of a heavy drop bar which falls into position on the notched hookoff bar. When the hookoff bar is stopped, the rod line releases itself by means of a link at the power end of the bar. It is, of course, necessary for the pumper to connect the well when the time comes for its next pumping period.

By regulating the position of the cast-iron weight and the hinged finger which it engages, the hookoff can be made to operate as soon as the fluid pound develops in the well or at any subsequent time up until the well is completely pumped off.

Grindout test on the crude at one lease showed that automatic hookoff devices has decreased the b.s. content from 0.8 to 0.2 per cent. Since less treating was required, the oil did not have to be held so long in the lease stock tanks, and it was noted that there was less tendency to lose gravity.

The most conspicuous improvement in lease operation rendered by the automatic hookoff has been the reduction in amount of well servicing required. By avoiding fluid pound on one lease where four part-time wells were operating, well servicing was reduced from approximately one pulling job per month to one pulling job every 3 months, and the well-servicing requirement is apparently still decreasing.

Beam Pumping

Much of the recent study of beam-pumping problems has been directed toward determination of stresses on pumping equipment. The ultimate objective has been to make it possible to predict working loads within close limits so that the beam-pumping assembly can be designed as an integral unit with no parts unnecessarily strong and no members too weak to withstand uninterrupted service for a reasonable length of time. The various parts of the pumping system, including pump, sucker rods, tubing string, pumping unit, and prime mover, all influence one another in operation, therefore, integral design seems called for. However, attempts to analyze the dynamic forces involved in a variety of wells become so involved that in the past most pumping equipment has been selected largely by custom, by field observation, or merely by guess.

Recently several companies have adopted the practice of designing the pumping system from well bottom to prime mover in a series of progressive steps with each part being built to withstand the calculated stresses to which it will be subjected. While calculation of stresses is necessarily somewhat inaccurate because of the many variables and unknowns, it is felt that the data available on this subject should be used on the lease rather than awaiting more thorough investigations. One company's method of designing the pumping system to its expected service has resulted in noteworthy economy. This method is set forth with accompanying reference data in Section J of the Producing Equipment Directory.

(Continued on Page 216)

ento, que están funcionando con gas de cloaca o con gas natural, que contiene comparativamente grandes porciones de sulfiyo de hidrógeno. Aun con un combustible de esta clase, la formación de cieno queda reducida a una cantidad insignificante. En vista de que casi todos los combustibles de motor contienen una apreciable cantidad de compuestos de azufre, el funcionamiento con gas crudo representa sólo una aceleración de las influencias de deterioración que actúan en el motor de explosión interna. Un automóvil provisto de un motor enfriamiento en fase de vapor se ha corrido como 25,000 millas sin cambio de aceito o de filtro de aceite. El aceite está todavía en buen estado, salvo una pequeña acumulación de partículas de carbón.

Efecto de la temperatura de enfriamiento sobre el rendimiento

El enfriamiento en fase de calor puede aumentar el rendimiento efectivo del motor de 3 a 4 por ciento, bajo carga completa, y hasta 8 o 10 por ciento, bajo carga parcial.

Operacion de pozos de producción limitada

En la explotación de pozos de limitada producción, el desarrollo más sobresaliente del año padado fué la introducción de un dispositivo que sirve para desconectar automaticamente cada pozo de la central de fuerza, tan pronto como ha completado su producción diaria. La rutina más consumidora de tiempo para el encargado del equipo de bomba en un grupo de pozos de limitada producción diaria, es cerrar los pozos después de terminada su producción cuotidiana. Aunque el mismo trabajo es sencillo, la necesidad de estar personalmente presente cada vez que el pozo termina su período diario de extracción, no permite el encargado dar atención a otros trabajos constructivos en la propiedad. En muchos casos, estas frecuentes interrupciones le impiden dar al equipo debida atención cuidado en lo concerniente a su conservación.

Determinacion del tiempo de cierre de los pozos

Gran parte del tiempo del encargado de las bombas se dedica a determinar el momento de cerrar los pozos después de que éstos han extraidos sus cuotas diarías. Hay variación de opinión acerca de cuándo se llega a este punto, habiendo algunos que sostienen que el pozo ha de cerrarse tan pronto como empiece a producir golpeteo de líquido, mientras otros recomiendan que lo mejor es continuar bombeando después de desarrollado el golpeteo, a fin de obtener una producción máxima. Apartándonos de esta controversia, por el momento, debemos explicar que el golpeteo de líquido es causado por la incompleta llenada del cilindro, lo cual hace que el émbolo y las bielas o varillas caigan rapidamente en el carrera descendente hasta que el émbolo da golpe al líquido.

Este efecto de superficie de la extracción se utiliza en el dispositivo de cierre automático. El pié del empleado queda reemplazado por un peso de hierro fundido, que sirve para inducir el alflojamiento del cable de varilla. Cuando la ausencia de líquido en el cilindro hace que el cable de ponga tieso en la carrera de bajada, esta tensión levanta el peso a una posición en que toca un dedo articulado, que sobresale hacia abajo de una varilla correditza colocada encima del cable de varilla. Mediante este contacto, la varilla superior as empujada hacia atrás, causando la soltura o disparo de una pesada barra que cae en la barra de enganche ranurada. Cuando se para la barra de enganche, el cable de varilla se desconecta por medio de un eslabón en el extremo de fuerza de la barra. Es, por supuesto, necesario que el empleado conecte el pozo cuando se presente el tiempo para el segundo período de extracción.

Regulando la posición del peso de hierro fundido y el dedo artículado con el cual se engancha, la conexión puede hacerse funcionar tan pronto como se desarolle el golpeteo de líquido en el pozo o en cualquier momento siguiente hasta que se haya hecho toda la extracción periódica del pozo. El ensayo de petróleo crudo producido en una propiedad mostró que los dispositivos de desconexión automática redujieron los sedimentos de fondo de 0,8 a 0,2 por ciento. Como se necesitó menos tratamiento, el petróleo no tuvo que permanecer mucho tiempo en los tanques de la propiedad, y se observó que hubo menos tendencia a pérdida de peso específico.

El mejoramiento más importante que se ha conseguido en la explotación de estas propiedades, mediante la instalación de dispositivos de desconexión automática, ha sido la reducción en la cantidad detrabajo de reparación y cuidado requerida. Evitando el golpeteo de líquido en una propiedad con cuatro pozos de extracción parcial, el cuidado de los pozos fué reducido de una limpieza al mes a una limpieza cada tres meses, y los requisitos de servicio de todos los pozos continuan todavía en descenso.

Extracción con bomba de balancín

Gran parte del reciente estudio de los problemas de la extracción con bomba de balancín ha sido dirigido a la determinación de las tensiones sobre el equipo de bombas. El objectivo final ha sido la posibilidad de predecir las cargas de trabajo dentro de limites exactos, para poder construir el grupo de bomba de balancín como una unidad integrante, sin ninguna pieza innecesariamente firme y sin nigún miembro demasiado debil para resistir el servicio sin interrupción durante un racional período de tiempo. Las varias piezas del sistema

(Continue en Pagina 216)

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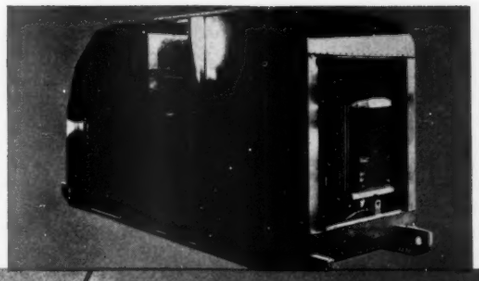
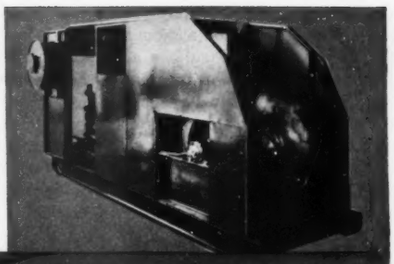
Lane-Wells Gun Perforator Truck Unit in Colombia

Perforador de pistola Lane-Wells, montado en camión, usado en Colombia



Another Lane-Wells Gun Perforator Skid Unit in Venezuela

Otro perforador de pistola Lane-Wells, montado en patines, en uso en Venezuela



One of the Lane-Wells Gun Perforator Skid Units in Venezuela

Uno de los perforadores de pistola Lane-Wells en patines, usados en Venezuela

LANE-WELLS GUN PERFORATOR OUTFITS cut perforating costs in South American oil fields

Lane-Wells Gun Perforator Truck Unit for use in Peru

Perforador de pistola Lane-Wells, montado en camión, para uso en el Peru

Another Lane-Wells Gun Perforator Truck Unit for use in Colombia

Otro perforador de pistola Lane-Wells, montado en camión, para uso en Colombia.

Lane-Wells Gun Perforator Skid Unit in Trinidad is mounted on a flat bed truck

Perforador de pistola Lane-Wells, montado en patines, y colocado en camión, en Trinidad

Progressive South American Oil Companies know that Lane-Wells Gun Perforator Outfits cut perforating costs because these outfits are designed for efficient operation by oil company personnel. Lane-Wells Gun Perforator enables oil operators to use modern completion methods in drilling wells and to plug-back and produce secondary zones in cased wells. ¶ There are six Lane-Wells Gun Perforator outfits in South American Oil Fields. The types of equipment especially designed for South America are illustrated. Each unit is engineered to give deeper penetration with utmost safety and absolute accuracy. Full details and specifications of Lane-Wells Gun Perforator units designed for South American use and how they cut your perforating costs can be obtained by writing Lane-Wells.

Las más emprendedoras compañías petrolíferas sudamericanas saben que los perforadores de pistola Lane-Wells reducen los gastos de perforación, a causa de que estos equipos han sido proyectados para trabajar perfectamente por el personal de compañías de petróleo. El perforador de pistola Lane-Wells habilita a los explotadores de petróleo para valerse de modernos métodos de terminar la perforación de pozos y de profundizar los pozos canalizados para llegar a arenas secundarias productivas. Hay seis equipos de perforadores de pistola Lane-Wells en los campos petrolíferos sudamericanos. Mostramos aquí estos tipos de equipo especialmente proyectados y construídos para el trabajo en la América del Sur. Cada grupo está construído para hacer una penetración más profunda con absoluta seguridad y exactitud. Solicite información completa, acerca de los perforadores de pistola Lane-Wells construídos especialmente para el servicio sudamericano, para que se dé cuenta cabal de las economías en gastos de perforación que producen.

LANE-WELLS COMPANY

5610 South Soto St.
Los Angeles, Calif.

420 Lexington Avenue
New York City, N. Y.

(Continued from Page 213)

Subsurface Pumps

A late development of unusual character in subsurface pumps has been the introduction of a plunger which uses composition rubber and fabric rings mounted in machined grooves. After the rings have been fitted loosely to the grooves, the plunger is dipped in kerosene. This acts on the rubber causing the rings to swell so that by the time the plunger is installed in the working barrel a snug fit is brought about. The number of rings used is dependent upon the depth of the well. Under test it many fields these plungers have proved most suitable for wells producing water and sand. Water acts as a lubricant for rubber, a fact which is most readily realized when an automobile skids on a wet street. Some wells produce such a small per cent of oil in the total fluid that there is insufficient lubrication for operation of a metal-to-metal plunger pump. In such wells the rubber rings offer an effective seal with a low coefficient of friction. As the rubber is flexible it is resistant to sand abrasion. Only a small edge of each ring is exposed to attack from oil in the well, but this causes enough swelling to maintain a tight fit against the working barrel. When the rings become worn to an extent where swelling will no longer produce a satisfactory fit, they are replaced. The plunger itself does not come into contact with the working barrel during normal operation, so that it can be reused with several sets of rings.

Multiple-Well Hydraulic Pumping System

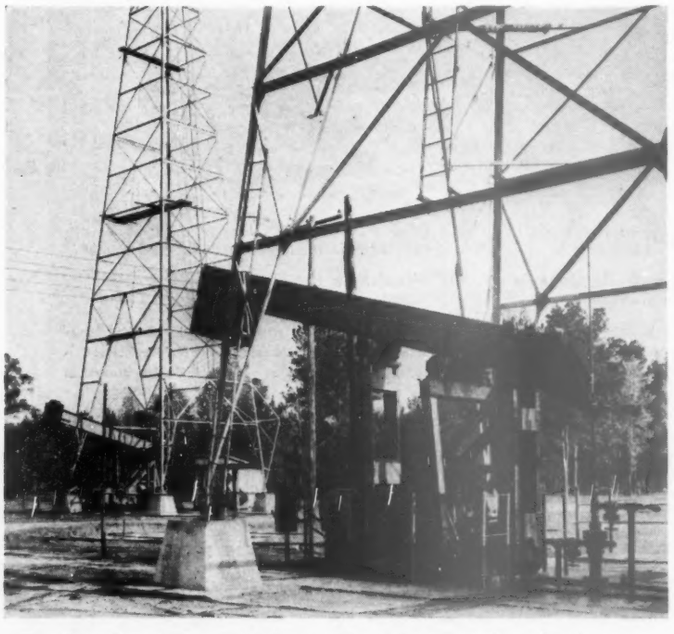
An interesting application of the hydraulic pumping system is being developed in the Kansas fields, where a large number of shallow wells are often pumped from one surface unit. The hydraulic system for oil-well pumping has been in use for some years and is described with accompanying reference data on Pages M-4 to M-7 of the Producing Equipment Directory. In simplest terms, the system makes use of a surface unit for pumping clean oil under pressure to a reciprocating pump in the bottom of the well. The subsurface pump, actuated by the power oil, pumps the well fluid to the surface. Power oil discharged from the subsurface pump mingles with the well fluid on its way to the surface.

Since the hydraulic pumping system was originally applied to exceptionally deep wells, unusually crooked wells, or wells where large volumes of oil were to be produced, its application to 1,500-ft. Kansas wells is of interest. At present there are 11 wells of this depth operated from a single surface pump, but new wells are being drilled and as these are completed they are added to the pumping system. Since no counterbalancing is necessary with this type of equipment, it makes little difference where the new locations are with respect to the wells already pumping. In some cases power oil is piped for a distance of more than a mile on the surface to connect a new well to the central-power oil supply.

In Illinois a multiple-well hydraulic system operates twelve 3,400-ft. Devonian pumpers from a single surface pump. In Louisiana two 6,000-ft. wells are operated economically although their combined oil-producing capacity never exceeds 40 bbl. per day. Three hydraulic pumps are now being operated at depths below 9,000 ft.

Secondary Recovery

A new production practice has grown up in the St. Louis pool of Oklahoma which can be classified broadly as secondary recovery, al-



Two large long-stroke straight-lift pumping units operated by electric motors
Dos grupos de bombar grandes, de carrera larga, de levantamiento recto, accionados por motores eléctricos

(Continue desde Pagina 213)

de bomba, incluyendo la bomba misma, varillas de bomba, series de tubos, mecanismo de la bomba y el motor, todas tienen recíproca influencia en el trabajo, y por esta razón, se recomienda la construcción integral. Sin embargo, al tratarse de analizar las fuerzas dinámicas envueltas en una variedad de pozos, se presenta un problema muy complicado, y por esta razón, la selección de casi todo el equipo de bomba se ha basado, hasta ahora, en la costumbre, observaciones en el campo y simple suposición.

Recientemente, varias compañías han adoptado la práctica de proyectar sus sistema de bomba, de fonda de pozo a motor, en una serie de pasos progresivos, con cada pieza construida para resistir los esfuerzos calculados a que quedará sujeta en el trabajo. Aunque el cálculo de las tensiones o esfuerzos es necesariamente inexacto, a causa de los muchos factores variables y desconocidos, se cree que los datos disponibles sobre el tema, deberían usarse en la propiedad, más bien que esperar los resultados de investigaciones más completas. El método de una compañía, para la designación del sistema de bombas, de acuerdo, con el servicio asticipado, ha resultado en una economía notable. Este método se explica, con acompañamiento de datos de referencia, en la sección J del Directorio de Equipo de Producción.

Bombas subterráneas

Un desarrollo reciente de caracter extraordinario, en bombas subterráneas, ha sido la introducción de un émbolo, que usa anillos de composición de caucho y tela montados en ranuras labradas a máquina. Después de colocados los anillos con cierta soltura en las ranuras, el émbolo se sumerge en keroseno. Esto actúa sobre la tela, haciendo hincharse a los anillos, de modo que al instalarse el émbolo en el cilindro de trabajo, se obtiene un ajuste muy conveniente. El número de anillos usados depende de la profundidad del pozo. En ensayos en muchos campos, estos émbolos han resultado muy satisfactorios en pozos productores de agua y arena. El agua actúa como lubricante para el caucho, un hecho que se comprende facilmente cuandro un automóvil patina sobre una calle mojada. Algunos pozos producen una cantidad tan pequeña de petróleo en relación al líquido total, que hay insuficiente lubricación para el funcionamiento de una bomba de émbolo de contacto de metal contra metal. En semejantes pozos, los anillos de caucho ofrecen un cierre efectivo con un bajo coeficiente de rozamiento. Como el caucho es flexible, resulta resistente al raspaje por la arena. Sólo un pequeño borde de cada anillo queda expuesto al ataque del petróleo en el pozo, pero esto produce bastante hinchazón o abultamiento para conservar un ajuste hermético contra el cilindro de trabajo. Cuando los anillos se desgastan hasta un punto en que su abultamiento o hinchazón no produce más un ajusté satisfactorio, se renuevan. El émbolo mismo no tiene contacto con el cilindro de trabajo durante el funcionamiento normal, de modo que puede usarse de nuevo con varios juegos de anillos.

Sistema de bombas hidráulicas de pozos multiples

Una interesante aplicación del sistema de boma hidráulica se está desarrollando en los campos petrolíferos de Kansas, donde un gran número de pozos de poca profundidad se accionan a menudo con una sola instalación de superficie. El sistema hidráulico para la extracción de petróleo de pozos se ha usado desde hace varios años y se describe con datos de referencia en las páginas M-4 a M-7 del Directorio de Equipo de Producción. En los términos más sencillos, el sistema se vale de una instalación de superficie para inyectar petróleo limpio, bajo presión, a una bomba de movimiento alternativo dispuesta en el fondo del pozo. La bomba subterránea, actuada por el petróleo de fuerza, extrae el flúido del pozo a la superficie. El petróleo de fuerza descargado de la bomba subterránea se mezcla con el flúido del pozo en camino a la superficie.

Como el sistema de bomba hidráulica fué originalmente aplicado a pozos extraordinariamente profundos, pozos muy torcidos o pozos de una gran producción de petróleo, su aplicación a pozos de 1.500 pies en Kansas, es de particular interes. Al presente hay once pozos de esta profundidad trabajados mediante una sola bomba de superficie, pero se están perforando nuevos pozos, y a medida que estos se terminen, se agregarán también al sistema. Como no hay necesidad de ningún contrapeso con este tipo de equipo, hace muy poca diferencia el punto de ubicación de los nuevos pozos, en relación con los pozos ya bajo explotación. En algunos casos, el petróleo de fuerza se conduce por tubería por una distancia da más de una milla, sobre la superficie, para conectar un nuevo pozo al abastecimiento central de petróleo de fuerza.

En Illinois, un sistema hidráulico de pozos múltiples opera doce pozos devonianos de 3.400 piés, con una sola bomba de superficie. En Luisiana, dos pozos de 6.000 piés se operan economicamente, a pesar de que su capacidad combinada nunca pasa de 40 barriles al día. Tres bombas hidráulicas están ahora trabajando a profundidades mayres de 9.000 piés.

Recuperación secundaria

Una nueva práctica de producción ha aprecido en el yacimiendo de San Luis en Oklahoma, la cual puede clasificarse como recuperación secundaria, a pesar de que no necesita la inyección de un medio de expulsión. Aunque es una práctica que puede aplicarse sólo a un cierto tipo de yacimiento, hay varias observaciones que indican que su uso puede también ser aprovechado en un gran número de yacimientos carcáreos o dolomitas.

Casi toda la perforación en el yaci-

though it does not require the injection of an expulsive medium. While it is a practice that can be applied only in a certain type of reservoir, there are many observations to indicate that its use may be applicable to a large number of limestone or dolomite pools.

Most of the drilling in the St. Louis pool occurred in 1927, and the peak gas production was past in February 1928, after which the decline was very sharp. As early as August 1929, over half of the wells were producing water, and by 1933, the field was described as "drowned out" by the vast volumes of encroaching water. Then the "secondary recovery" cycle was started. This consisted in installing large-capacity electrical submersible pumps to handle the encroaching water. Results were surprisingly good. Oil which had been trapped off by the water was washed into the wells so that the oil-water ratios tended to increase as more fluid was handled. Then, after the head on the encroaching fluid was lowered through removal of fluid, the gas which had been trapped with oil in structural, stratigraphic, or porosity traps was given a chance to expand, thereby forcing additional oil to the low-pressure areas about the well bores. So successful has been this method of extending the productive life of the pool that 300 new wells have been drilled as a direct result.

The type of secondary recovery developed in the St. Louis pool may be described fairly accurately as a form of water flooding in which the formation water is utilized for flooding purposes rather than surface water introduced into the formation.

Recycling

Pressure maintenance applied to high-pressure gas-condensate production is termed "recycling." The operation consists in production of the gas, removal of liquid hydrocarbons at the surface and recompression and injection of the stripped gas to the formation from which it was originally produced.

The recent discovery of many high-pressure gas fields as a result of deeper drilling has led to a study of the phase equilibria of hydrocarbon mixtures at high pressures. In contrast with their behavior at normal pressure, the heavier hydrocarbons in a rich gas mixture are found to vaporize upon increase in pressure, and conversely, condense from the vapor to the liquid phase on pressure reduction to a certain point, determined by the characteristics of the mixture. This phenomenon has been termed "retrograde condensation."

If reservoir pressure is allowed to decline in high-pressure gas fields, the heavier hydrocarbons will condense underground, and, wetting the sand, will become irrecoverable. In addition, many such gas fields cannot be produced, since law prohibits gas waste and no local outlet for the gas is available. Recycling becomes necessary in such cases, to recover the condensate and to produce the properties and realize a return where no immediate market is available.

Recycling plants comprise two units; liquid separation and finishing, and gas compression. They are tied into a field system which will employ production and injection wells in such a pattern that maximum displacement of rich gas by lean gas is effected. Unitization of acreage in such fields is very beneficial in obtaining maximum recycling results.

Condensate extraction may utilize any one, or combinations of three operations, absorption, pressure reduction and temperature reduction. The simplest plants consist of separators which remove the liquid as it condenses with one or more stages of pressure reduction. Low temperatures are employed with advantage in some cases to increase condensation, but gas must be dehydrated if temperatures are obtained below the point at which gas hydrates form.

Most of the latest plants installed employ high-pressure absorption, at pressures ranging as high as 1,850 lb. per sq. in. Excepting for the high pressures at which they operate, they closely resemble natural-gasoline plants.

It is desirable to reduce the pressure of the gas as little as possible, since compression equipment needed to boost the lean gas to injection pressure represents a major part of plant cost. Optimum operating pressure must be determined by weighing condensate yield against compression cost. Since no two high-pressure gas fields produce the same gas mixtures, yield determinations should be made by correctly sampling well production and duplicating proposed plant operations on a small scale in testing units.

Condensate produced in recycling plants varies considerably in gravity, composition and other characteristics. It is governed by composition of the gas and by plant operating conditions. Some liquids contain hydrocarbons with as high a molecular weight as those found in heavy gas oil.

At present, uses for condensate are varied. Some plant production is mixed with crude. An increasing volume is being fractionated at the plant into motor fuel. Condensate shows a high lead susceptibility in most cases, and much is now blended with tetraethyl lead and marketed as regular-grade gasoline. The rapid increase in such production during the past year has exerted a marked local effect on the gasoline market. A probable outlet for the product in the future is to reforming units for manufacture of high-octane gasoline.

As prices received for the raw distillate vary according to gravity, sulfur, gasoline content and other properties, many plants being constructed include facilities for manufacturing natural gasoline, motor fuels and kerosene distillate. This enables the operator to receive a higher overall price for his distillate production.

miento de San Luis occurrió en 1937, y la producción máxima de gas pasó en febrero de 1928, observándose después una gran disminución. A principios de agosto de 1929, casi la mitad de los pozos estaban produciendo agua, y para 1933, el campo fué descrito como "ahogado" debido a la gran cantidad de agua presente. Se empezó entonces el ciclo de la "recuperación secundaria." Este consistió en instalar bombas eléctricas sumergibles, de gran capacidad, para el manejo del agua. Los resultados fueron sorprendentemente buenos. El petróleo, que había sido tapado por el agua, fué metido en los pozos, de modo que las relaciones de petróleo y agua tendían a aumentar a medida que crecía el manejo del agua. Luego, después da que la presión del flúido fué bajada mediante la extracción del líquido, el gas que había sido retenido en trampas estructurales, estratigráficas o de porosidad, recibió la oportunidad de dilatarse, forzando adicional petróleo a los puntos de baja presión cerca de los pozos. Tan satisfactorio ha resultado este método de extender la vida productiva del yacimiento, que se han perforado como 300 nuevos pozos, para sacar provecho del nuevo procedimiento.

El tipo de recuperación secundaria desarrollado en el yacimiento de San Luis puede describirse con bastante exactitud diciendo que es una forma de anegación de agua en la cual el agua de la formación se utiliza para los fines de anegar, más bien que la aplicación de agua de superficie introducida en la formación.

Reciclación

La mantención de presión, aplicada a la producción de condensado de gas a alta presión se llama "reciclación." La operación consiste en la producción del gas, extracción de los hidrocarburos líquidos en la superficie y recompresión e inyección del gas rectificado en la formación de donde fué originalmente sacado.

El reciente descubrimiento de muchos campos de gas a alta presión, como resultado de la perforación a mayor profundidad, ha conducido al estudio de la fase de equilibria de las mezclas de hidrocarburos a altas presiones. En contraste con su comportamiento a presión normal, los hidrocarburos más pesados en una fuerte mezcla de gas, se ve que se evaporan bajo un aumento de presión, y se observa al mismo tiempo, que se condensan de la fase de vapor a la fase líquida, al reducirse la presión a cierto punto, determinado por las características de la mezcla. Este fenómeno se ha llamado "condensación retrógada."

Si la presión del yacimiento se deja declinar en los campos de gas de alta presión, los hidrocarburos más pesados se condensarán debajo del suelo, y al empapar o humedecer la arena, no podrán recuperarse. Además, muchos de estos campos de gas no pueden trabajarse, a causa de que la ley prohibe el desperdicio del gas y no hay generalmente disponible una salida local para su aprovechamiento. La reciclación, por lo tanto, se hace necesaria en semejantes casos, para recuperar el condensado, hacer productivas las propiedades y obtener un ingreso donde no existe un immediato mercado para el gas.

Las instalaciones de reciclación comprenden dos unidades: la de separación líquida y acabado, y la de compresión de gas. Se coordinan con un sistema de campo que empleará pozos de producción y de inyección de una manera que se efectúe un desplazamiento mínimo del gas rico por el gas pobre. La unificación del terreno en semejantes campos es muy beneficiosa para obtener máximos resultados de la reciclación.

La extracción de condensado puede utilizar una o bien, combinaciones de tres operaciones: absorción, reducción de presión y reducción de temperatura. Las instalaciones más sencillas consisten en separadores, que extrae el líquido cuando se condensa con una o más etapas de reducción de presión. Las temperaturas bajas se emplean ventajosamente en algunos casos, para aumentar la condensación, pero el gas debe deshidratarse cuando se obtienen temperaturas más bajas que el punto a que se hidrata el gas.

Casi todas las instalaciones hechas recientemente emplean la absorción a alta presión, a presiones que llegan a 1850 libras por pulgada cuadrada. Exceptuando las altas presiones a que funcionan, se parecen mucho a las instalaciones de gasolina natural.

Conviene reducir la presión del gas lo menos que se pueda, pues el equipo de compresión que se necesita para aumentar la fuerza del gas pobre a la presión de inyección, representa la parte principal del costo de la instalación. La presión de trabajo óptima deberá determinarse comparando el rendimiento de condensado con el costo de la compresión. Como nunca hay dos campos de gas de alta compresión que produzcan las mismas mezclas de gas, las determinaciones de los rendimientos deben hacerse probando correctamente muestras de la producción del pozo y duplicando las operaciones de la instalación propuesta en una escala pequeña, en unidades de ensayo.

El condensado producido en instalaciones de reciclación varía considerablemente en peso específico, composición y otras características. Está gobernado por la composición del gas y por las condiciones de trabajo de la instalación. Algunos líquidos contienen hidrocarburos con un peso molecular tan alto como los que se encuentran en el petróleo de gas pesado.

Al presente, el condensado se presta a varios usos. Parte de la producción se mezcla con petróleo crudo. Una creciente cantidad se somete a fraccionación en la planta, para su conversión en combustible de motor. El condensado muestra gran susceptibilidad al plomo, en la mayor parte de los casos, y se está ahora mezclando con tetraetilio de plomo y vendiéndose como gasolina de clase regular.

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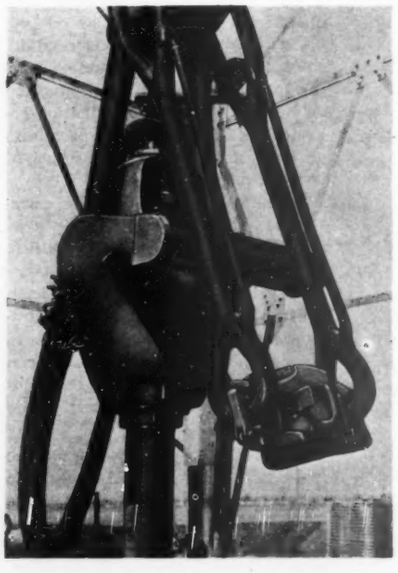

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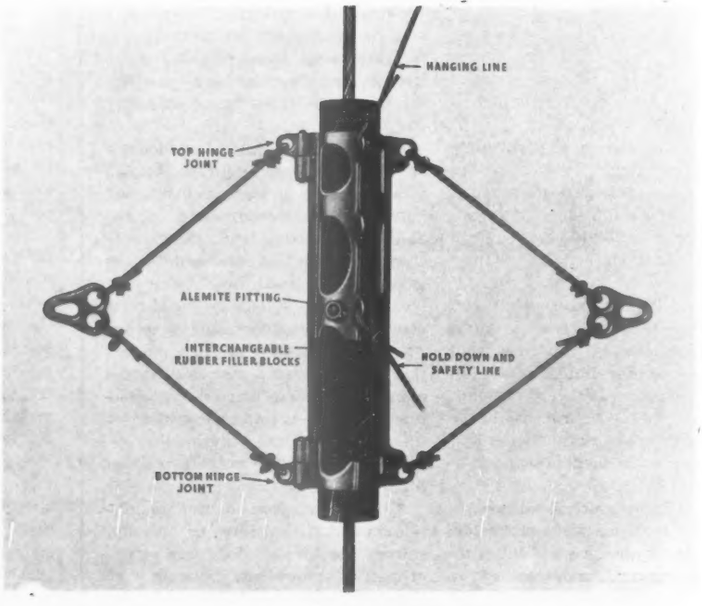
Completely protects the elevator bails and swivel. Eliminates metal-to-metal contact of elevator links with the swivel, thus reducing wear, decreasing fatigue, and making for safer operations. Sizes to fit all swivels.



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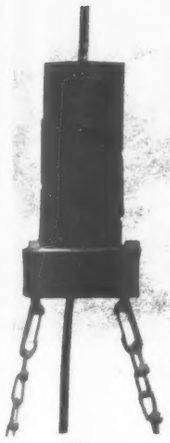

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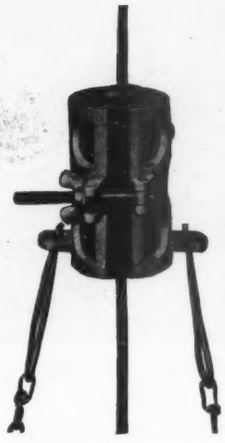
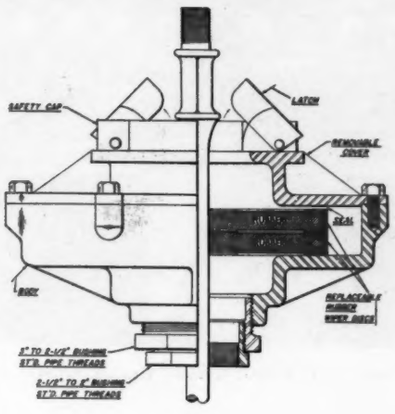


8.

WIRE LINE WIPER
Style B

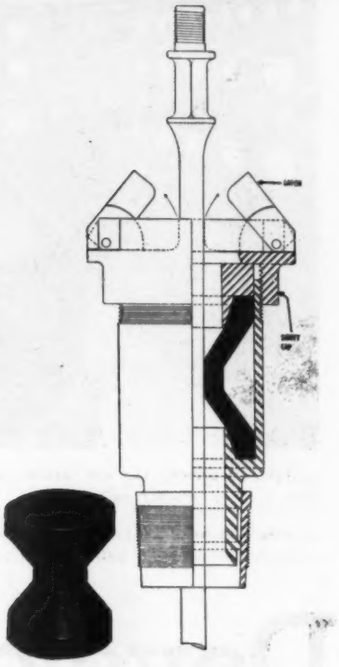
Designed for service on producing wells where gas and high gravity oil are encountered. Consists of steel housing, hinged for quick insertion of rubber refill. Equipped with hold down chains.



9.

UNIVERSAL SUCKER ROD WIPER

Very compact. In the steel housing is a double seal consisting of two freely floating, self-aligning, reinforced discs of tough, wear-resisting rubber, of a design similar to the Pipe Wiper. Designed to wipe Rods from ⅝" to 1⅛". Keeps derrick floor clean.



10.

STANDARD SUCKER ROD WIPER

This type is comprised of a 4" housing in which is dropped a replaceable spool-shaped refill rubber that wipes ⅝" to ¾" rods. Body is a friction grip into a standard 3" pipe thread guide which gives full clearance for all sizes of pumps.

PATTERSON-BALLAGH RUBBER PRODUCTS
PRODUCTOS DE CAUCHO PATTERSON-BALLAGH

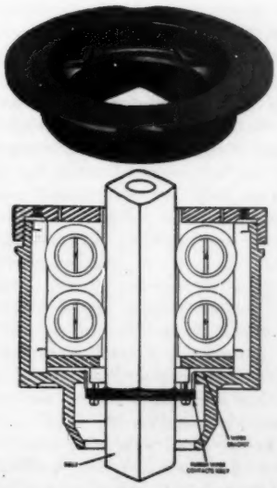
1. PROTECTOR. Da protección al tubo de perforación y tubería de revestimiento. Impide el roce. Hecho completamente de caucho. Se usa en casi todos los pozos profundos.
2. ESTABILIZADOR. Para perforación de agujero adescubierto. Evita los golpes destructivos. No perturba la circulación de lodo.
3. PROTECTOR DE TUBERIA. Evita el desgaste del collar y tubería causado por la pulsación de la tubería al extraer el líquido del pozo.
4. PISTOLA O INYECTOR UNIVERSAL DE LODO. De doble paso compensado. Mantiene en circulación el lodo y lo mezcla muy bien.
5. AMORTIGUADOR DE ASAS DE ACHICADOR GIRATORIO. Da protección a las asas y soporte giratorio del elevador. Elimina el contacto de metal contra metal. Se suministra por el fabricante del acoplamiento giratorio, cuando Vd. lo especifique.
6. GUIA DE CABLE DE ALAMBRE. Un cilindro con grueso forro de caucho. Evita la vibración del cable y lo estabiliza. A prueba de chispa.
7-8. LIMPIADORES DE CABLES DE ALAMBRE. Dos tipos muy buenos para la completa limpieza de cables de alambre.
9. LIMPIADOR UNIVERSAL DE VARILLA DE BOMBA. Muy compacto. En caja de acero. Su doble cierre consiste en dos discos completamente flotantes, de alineación automática, de caucho bien firme.
10. LIMPIADOR NORMAL DE VARILLA DE BOMBA. Dentro de la caja se coloca un carrete de caucho. El pestillo de arriba sujeta la varilla.
11. LIMPIADOR DE KELLY. Disco de caucho en caja buje de kelly de tipo de cojinete de rodillo. Fabricamos el limpiador solamente.
12. LIMPIADOR DE TUBO. Consiste en un disco de caucho de trabajo pesado, que limpia perfectamente el tubo al salir de la plataforma de la rotativa.

Para otros detalles, vea el CATALOGO COMPUESTO o escribanos.

PATTERSON-BALLAGH CORPORATION

Los Angeles, Calif.	Houston, Texas	New York City
1900 E. 65th St.	1506 Maury St.	92 Liberty St.

See 1941 Composite Catalog for further details and specifications.



11.

KELLY WIPER

12.

PIPE WIPER

This Pipe Wiper (shown above) consists of a heavy-duty disc of rubber which wipes the pipe cleanly as it comes from the rotary table. Very desirable for winter drilling. Made in all sizes. Keeps derrick floor clean. Strongly reinforced. By cutting or wearing down the hole, can be later used to fit larger pipe.

The Kelly Wiper is for stripping the kelly. Three types available to fit in kelly roller bearing housing. These types are described in the 1941 Composite Catalog.

Instruments serving the new ketone dewaxing unit in the Sarnia, Ontario, Canada, refinery of Imperial Oil Co., Ltd. This is typical of the control rooms of large modern process units

Instrumentos empleados en la nueva instalación de desparafinación de ketona, en Sarnia, Ontario, Canadá, en la refinería de la Imperial Oil Co., Ltd. Esto es típico de las salas de control de las grandes instalaciones modernas

Developments in Refining
Desarrollos en Refineria

ANY appraisal of the petroleum-refining industry must be made in light of national-defense needs. The lessons being gained from the war in Europe point emphatically to the primary importance of petroleum products.

Until now, the productive capacity of the industry has been such as to make available sufficient supplies to meet all demands from military, commercial and export consumers for 100-octane fuel. There could be a lag between production and a rapidly multiplied consumption. Current specifications are extremely rigid and performance from such fuels has been highly satisfactory. If demand should outstrip production, small deviations from present standards would materially increase the output. It is estimated that raising the ethyl-fluid tolerance from 3 to 4 cc. per gallon would increase the volume of available 100-number fuel six times. Increasing the vapor pressure from 7 to 8 lb. per sq. in. maximum would enlarge production four times. A slight decrease in volatility would have the effect of tripling its availability. The cumulative effect of the three changes is estimated to increase the availability of 100-octane number fuel many times over. Such expedients will probably not be resorted to in full, although some slight broadening of specifications has already been tentatively made.

Petroleum derivatives have also become important from a national-defense standpoint in other fields than fuels and lubricants. One essential product is toluene, required for production of explosives. Refinery gases represent a source for conversion in addition to coal tar. The spread of war into the Far East would make the acquiring of natural rubber an uncertain factor. Rubber is a war necessity. Again, refinery gases are available for conversion into rubber substitutes.

The rapid trend toward the use of large numbers of tanks and tractors in land operations is of interest to refiners and army authorities alike. While the fuel requirements are not as severe as those for airplanes, they are nevertheless more rigid than for automobiles. Most tanks are powered by air-cooled, radial engines and require gasoline of 82-octane number in some cases and not less than 92-octane number in others. These fuels are similar to the lower-grade aviation gasolines.

Other mechanized equipment, including army cars, trucks, and motorcycles, would be served adequately by present fuels. Increased defense and preparedness activities will bring about increased fuel and lubricant requirements, but it is be-

TODA estimación de la industria de la refinería de petróleo deberá ahora hacerse en vista de las necesidades de la defensa nacional. Las lecciones que se están aprendiendo de la guerra en Europa señalan enfáticamente la importancia capital de los productos de petróleo.

Hasta ahora, la capacidad productiva de la industria ha tenido a su disposición suficientes abastecimientos para responder a toda la demanda de combustible de número octano 100 para fines militares, comerciales y de exportación. Podría presentarse una demora entre la producción y un consumo rapidamente multiplicado. Las características corrientes son en extremo rígidas y el funcionamiento de semejantes combustibles ha sido muy satisfactorio. Si la demanda llegara a sobrepasar a la producción, algunas pequeñas desviaciones de las normas presentas permitirían aumentar rápida y grandemente la producción de estos superiores combustibles. Se calcula que al aumentar la tolerancia de etilio flúido de 3 a 4 cc. por galón, se aumentaría la cantidad disponsible de combustible de número octano 100, por lo menos seis veces. Aumentado la presión de vapor de 7 a 8 libras por pulgada cuadrada, como máximo, aumentaría la producción total cuatro veces. Una leve reducción en volatilidad tendría el efecto de triplicar el abastecimiento disponible. El efecto acumulativo de los tres se calcula que aumentaría muchas veces la presente producción de combustible de número octano 100. Probablemente no se recurrirá a estos expedientes, en toda su extensión, pero seguramente se introducirán algunas alteraciones en las características, como se ha hecho ya tentativamente.

Los derivados del petróleo se han hecho también importantes desde el punto de vista de la defensa nacional, además de los combustibles y lubricantes. Un producto esencial es el tulueno, que se necesita para la producción de explosivos. Los gases de refinería representan una fuente para conversión, en adición al alquitrán de hulla. La propagación de la guerra en el oriente haría de la adquisición de caucho natural un factor dudoso o incierto. El caucho es una necesidad de guerra. De nuevo, los gases de refinería están listos para su conversión en caucho artificial o sintético.

La creciente tendencia hacia el uso de grandes cantidades de tanques militares y tractores, para operaciones terrestres, es de interes para los refinadores y las autoridades del ejército. Aunque los requisitos del combustible no son tan exigentes como los relativos a aviones militares, son, sin embargo, más rígidos que

lieved that the needs can be safely met.

Somewhat obscured by the war situation is the octane-number requirement now in effect. A sharp increase in the octane rating of house-brand and premium grades of motor fuels was effected right at the close of the year 1939. In a relatively short time the new values became standardized over the country.

The development of new processes and the improvement of old ones have meant cooperation between refinery engineering staffs, engineering and construction firms, parts suppliers, metallurgists and allied interests. Close teamwork is essential in order to achieve the results desired. Some of the conditions of pressure and temperature imposed to gain desired ends in the newer processes tax the ingenuity of fabricators and metallurgists.

Research

Research in the refining industry has broadened to include not only the refiner but many other agencies as well. These embrace federal bureaus, universities, equipment suppliers and individual researchers. Projects of fundamental nature that require years for completion, such as the work on isolation and identification of various pure hydrocarbons, are being carried on. It is difficult to realize the immediate value of the results obtained or how they can be translated into any practical application, yet directors are willing to invest large sums in such research with rather indefinite goals.

Process research involves more definite aims and is usually motivated by the desire to produce improved products or to reduce the cost of operation. Almost every year sees a new process that achieves one of these ends, such as converting waste gases into marketable gasoline or increasing cracking yields with production of higher octane-number fuel, or a new process for dewaxing oil that is cheaper to operate and produces higher-quality products.

The equipment supplier carries out research and experiment to improve on existing products and to supply new ones to meet changed requirements. New and improved steels for still tubes, better insulation, corrosionproof alloys for condenser and exchanger tubes, more efficient pumps and thousands of other items are constantly being sought.

In addition to processing and engineering research, the refiner is faced with continued study of his products for their adaptations to new requirements. A change in automobile motor design, for instance, is known to cause the lubricating oil to deposit varnish; a new gear operating under higher tooth pressure renders the ordinary lubricant of little value. Many other changes cause troubles until the laboratory can work them out.

Research on the conversion of hydrocarbons to fields far removed from fuels and lubricants looms in importance just at this time. Self-sufficiency of the nation is involved in some strategic materials and research enables the refiner to close the breach.

Synthesis

The synthesis of hydrocarbons, while not entirely new, plays a prominent part in petroleum technology and is constantly increasing in importance. Application of new processes is made to convert light hydrocarbons into high-octane fuels and to produce various chemical compounds normally made in other ways. Many of these latter items are competitive in normal times but take on a new importance in time of war due to increased requirements or to displacement of foreign-made goods.

It is interesting to note some of

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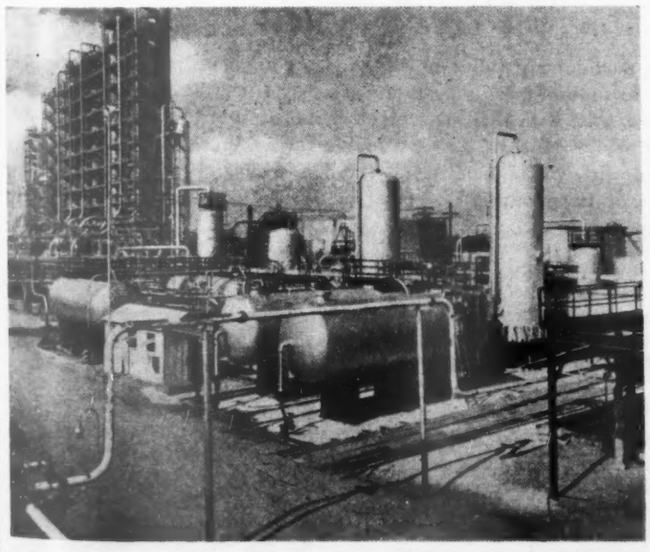


Alkylation unit in operation at the Baytown, Tex., refinery of the Humble Oil & Refining Co.

Instalación o unidad de alcalización en operación en la refinería en Baytown, Texas, de la Humble Oil & Refining Co.

los correspondientes a automóviles. Casi todos los tanques militares llevan motores radiales de enfriamiento por aire y requieren gasolina de número octano 82, y en algunos casos, de no menos de 92. Estos combustibles son similares a las gasolinas de aviación de clase inferior.

Otros equipos mecanizados, tales como los automóviles militares, camiones y motocicletas, podrán servirse adecuadamente con los presentes combustibles. Las crecientes actividades para defensa y preparación tendrán el efecto de introducir más exigentes requisitos en lo tocante a lubricantes y combustibles, pero existe la confianza de que la industria podrá satisfacer todas estas necesidades.

El requisito de número octano, hoy en efecto, ha sido algo oscurecido a consecuencia de la guerra. A fines de 1939 se introdujo un gran aumento de número octano a los combustibles de motor de marcas conocidas. En un tiempo relativamente corto, los nuevos valores se uniformaron en todo el país.

El desarrollo de nuevos procedimientos y el perfeccionamiento de los antiguos han representado cooperación entre el personal técnico de las refinerías, firmas técnicas y de construcción, suministradores de piezas, empresas metalúrgicas y otras actividades aliadas. El trabajo cooperativo es esencial para la realización de los resultados deseados. Algunas de las condiciones de presión y temperatura, que se presentan en la solución de problemas para obtener nuevos resultados y procedimientos más adelantados, parece a veces que llegaran a agotar la ingenuidad de los fabricantes e ingenieros, pero, en realidad, no logran detener la marcha del progreso.

Estudios

Los estudios en la industria de la refinería se han ensanchado hasta comprender no sólo al refinador, sino también a muchas otras agencias. Incluyen ahora las oficinas federales, universidades, suministradores de equipo y estudiantes particulares. Los proyectos de caracter fundamental, que requieren años para su terminación, tales como el asilamiento e identificación de varios hidrocarburos puros, se están llevando a cabo sobre esta base de amplia cooperación. Es difícil comprender el valor inmediato de los resultados obtenidos, o de cómo podrán traducirse en aplicaciones prácticas; más, a pesar de esto, los jefes de la industria están dispuestos a invertir gran sumas de dinero en semejantes estudios, sin tener determinados fines en vista.

Los estudios de procedimientos comprenden fines más definidos y están motivados por el deseo de producir productos mejorados o de reducir el costo del trabajo. Casi todos los años presencian un nuevo procedimiento que viene a realizar uno de estos fines, como por ejemplo, la conversión de los gases de escape en gasolina, o el aumento de rendimiento de la destilación por el procedimiento de cracking, con la producción de combustible de mayor número octano, o bien, todavía, un nuevo procedimiento para desparafinar el petróleo sobre una base más económica y más productiva de productos de mejor calidad.

Los suministradores de equipo emprenden también estudios y experimentos para perfeccionar sus presentes productos y suministrar nuevos modelos para responder a los cambios de requisitos. Nuevas y perfeccionadas aleaciones de acero para tubos de serpentines o alambiques, mejor aislamiento, aleaciones inoxidables para tubería de condensadores y cambiadores, bombas más eficaces y millares de otros productos, preocupan el interes constante de la industria.

En adición a estudios sobre procedimientos y prácticas técnicas, el refinador tiene que enfrentar una investigación constante de su producto, para adaptarlo convenientemente a los nuevos requisitos. Un cambio en construcción de automóvil, por ejemplo, podrá provocar una acumulación de barniz en las piezas tocadas por el lubricante; un nuevo engranaje, que funciona bajo mayor presión, podrá inutilizar el valor del lubricante corriente. Muchos otros cambios causan dificultades hasta que el laboratorio entra a resolver los problemas.

El estudio de la conversión de hidrocarburos a productos que no tienen ninguna aplicación como combustibles o lubricantes, está creciendo en importancia en estos momentos. La independencia nacional, en lo tocante a ciertas materias primas o materiales, de caracter estratégico, es lo que se busca en estos estudios, quedando la difícil tarea de hacerlo a cargo de los refinadores.

Sintesis

La síntesis de los hidrocarburos, aunque no es completamente nueva, desempeña importante papel en el tecnología del petróleo y continuamente aumenta en importancia. Se está aplicando un nuevo procedimiento para convertir los hidrocarburos livianos en combustibles de alto número octano, y para producir varias substancias químicas que normalmente se hacen de otras maneras. Muchas de estas últimas substancias son competidoras en tiempos normales, pero asumen una nueva importancia en tiempo de guerra, debido a crecientes requisitos de consumo o a la ausencia de similares productos procedentes del extranjero.

Es interesante observar algunos de los más importantes productos sintetizados de hidrocarburos de petróleo. Uno de los más antiguos es el alcohol de isopropilio, convertido de propileno en gas desintegrado (cracked). El alcohol etílico se hace de gases de refinería, y puede probablemente aventajar economicamente, al alcohol hecho de granos, para usos comerciales. El butilio, amilio y otros alcoholes más finos, se producen también sinteticamente de las varias fracciones de los gases desintegrados

(Continue en Pagina 228)

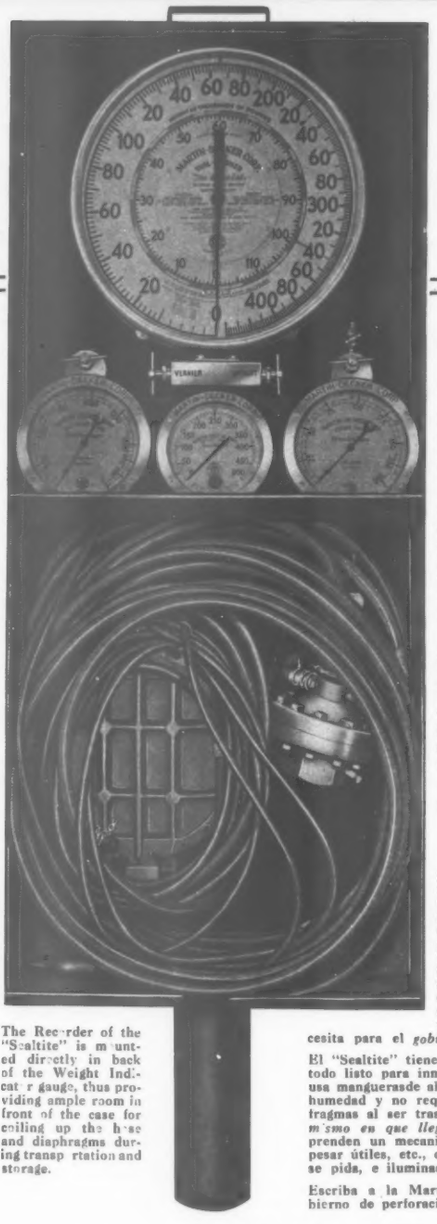
ON wells the world over you'll find Martin-Decker Instruments cutting drilling time and reducing equipment costs. With these instruments, operators accurately *control* weights, pressure, speeds and other important drilling factors to insure maximum hole per dollar!

The Martin-Decker Products shown here cover the complete range of control needs. They will fit right in with your current development program, whatever your requirements may be. Put them to work on your wells . . . *they'll prove the most valuable aid you can find to slice drilling costs.*

★

EN los pozos de todo el mundo se usan los instrumentos Martin-Decker para reducir el tiempo de la perforación y los costos de equipo. Con estos instrumentos, los dueños gobiernan exactamente los pesos, presiones, velocidades y otros importantes factores de la perforación, para asegurar rendimiento máximo por el precio.

Los productos Martin-Decker mostrados aquí cubren la completa escala de necesidades de gobierno. Se adaptarán correctamente a su corriente programa de desarrollo, no importa cuáles sean sus requisitos. Póngalos a trabajar en sus pozos . . . *con la seguridad de que le resultarán sumamente eficaces para reducir el costo de la perforación.*



The Recorder of the "Sealtite" is mounted directly in back of the Weight Indicator gauge, thus providing ample room in front of the case for coiling up the hose and diaphragms during transportation and storage.

The world's most Martin-D

"SEALTITE" DRILLING CONTROL

If you're looking for an instrument that will help you control *every* important drilling function . . . that's more accurate, sensitive and dependable than any previous instrument . . . that has capacity to handle the deepest well you drill . . . you'll find it in the "Sealtite." It shows—*continuously*—weight on bit, mud pump pressure, drill pipe torque and rotary table speed . . . and simultaneously records weight, mud pressure and torque on a single chart. With a temperature-corrected, direct reading Weight Indicator, able to handle *20,000 foot wells*, and Mud Pump, Torque and Tachometer Gauges having capacities for all modern speeds and pressures, the "Sealtite" is the instrument you need for *complete drilling control* under ALL conditions.

The "Sealtite" has all five control units in one compact steel box, ready for installation. The permanently closed and sealed fluid system (using high pressure hose instead of copper tubing) eliminates leakage, expansion and dampening effect and requires *no* pumping-up, *no* adjusting, *no* disconnecting from the diaphragms when moved from well to well. The "Sealtite" is ready to install *the minute it reaches your rig*. Other important "Sealtite" features include a vernier mechanism for accurate weight control when coring, fishing, etc., indicator dials calibrated in pounds, points, or the metric system, as desired, and indirect illumination for easy night reading.

Write Martin-Decker *today* for complete information on this outstanding Drilling Control Instrument.

GOBIERNO DE PERFORACION "SEALTITE"

Si Vd. anda en busca de un instrumento que le sirva para ayudarle a gobernar cada importante función de perforación . . . más exacto, sensitivo y seguro que todo otro instrumento anterior . . . con capacidad para adaptarse al pozo más profundo que Vd. perfore . . . hallará lo que desea en el "Sealtite". Este instrumento muestra, de una manera continua, el peso en la barrena, la presión de la bomba de líquidos lodosos, esfuerzo de rotación del tubo de perforación y velocidad de la plataforma de la rotativa . . . y simultaneamente registra el peso, el esfuerzo de rotación, la presión de la bomba de lodo, en una sola tabla. Con un indicador de peso, de temperatura corregida y lectura directa, capaz de manejar *pozos de 20.000 piés*, y manómetros de bomba de lodo, de esfuerzo de rotación y contador de velocidad, con capacidades para todas las velocidades y presiones modernas, el "Sealtite" es el instrumento que Vd. necesita para el *gobierno completa de la perforación*, bajo *toda* condición de trabajo.

El "Sealtite" tiene todas las cinco unidades de gobierno dispuestas en una compacta caja de acero, todo listo para inmediata instalación. El sistema de flúido permanentemente cerrado y sellado (que usa manguerasde alta presión, en lugar de tuberia de cobre) evita todo escape, efecto de dilatación y humedad y no requiere ninguna acción de bomba, ningún ajuste, ninguna desconexión de los diafragmas al ser trasladado de un pozo a otro. El "Sealtite" está listo para instalación *el momento mismo en que llega a su aparejo de perforación*. Otros importantes rasgos del "Sealtite" comprenden un mecanismo de vernier para el gobierno preciso del peso al sacar muestras o núcleos, pesar útiles, etc., cuadrantes de indicación graduados en libras, puntos, o en sistema métrico, como se pida, e iluminación indirecta para la fácil lectura nocturna.

Escriba a la Martin-Decker por información completa sobre este admirable instrumento de gobierno de perforación.

AUTOMATIC RATE OF PENETRATION RECORDER

This instrument *automatically and continuously* records bit penetration rate while drilling, putting time-drilling-logging on an accurate, fool-proof basis that makes the information far more valuable than ever before.

In overseas drilling, the data is particularly valuable in giving a composite picture of the formations drilled by showing all the formation breaks *as they occur*. It gives the operator a means of correlating weight, mud pressure, etc., with drilling weight to increase efficiency . . . it provides a means of checking equipment performance . . . it is valuable for comparison with the electrical log of the well . . . it helps decide the coring program . . . and it accurately indicates porosity of limestone formations. The Rate of Penetration Recorder is simple to install and use, and requires attention only once a day.

REGISTRADOR AUTOMATICO DEL REGIMEN DE PERFORACION

Este instrumento registra *automatica y continuamente* la velocidad de pentración de la barrena, durante la perforación, colocando el registro de tiempo de perforación sobre una base exacta y segura, y dando a esta información mucho más valor que el que ha tenido hasta ahora.

En la perforación en el extranjero, esta información es particularmente valiosa, pues da un cuadro completo de las formaciones perforadas, mostrando todas las interrupciones de la formación, a medida *que se presentan*. Da al encargado un medio de correlacionar el peso, presión de lodo, etc., con el peso de la perforación, para aumentar el rendimiento . . . provee un medio de verificar el funcionamiento del equipo . . . es muy valioso para la comparación con el informe de perforación por sistema eléctrico . . . ayuda a formular el programa de sacar muestras o núcleos . . . e indica exactamente la porosidad de las formaciones de pieza caliza. El registrador de régimen o velocidad de penetración es fácil de instalar y de usar, y requiere atención sólo una vez al día.

Efficient drilling jobs are controlled with Martin-Decker Instruments

QUINTUPLEX DRILLING CONTROL INSTRUMENT

The Quintuplex incorporates five important drilling gauges in one compact, rugged case. It indicates *and records* weight, mud pressure and torque in drill pipe, and shows rotary table speed. The record it provides is vitally important in guiding present as well as future drilling operations. The Quintuplex is accurate, sensitive and dependable, and is completely factory calibrated and tested for trouble-free operation on any well. You'll find it in daily use in every oil producing country.

INTRUMENTO DE GOBIERNO DE PERFORACION QUINTUPLEX

El Quintuplex comprende cinco indicadores de perforación en una firme y compacta caja. Indica y *registra* el peso, presión de lodo y esfuerzo de rotación del tubo de perforación; también muestra la velocidad de la plataforma de la rotativa. El registro que provee es de vital importancia en dirigir los presentes y los futuros trabajos de perforación. El Quintuplex es exacto, sensitivo y seguro. Se calibra y ensaya en la fábrica, para que funcione exento de irregularidad, en cualquier pozo. Se encuentra en uso diario en todo país productor de petróleo.

THE CLIPPER PORTABLE WEIGHT INDICATOR

Operators requiring a rugged, compact and highly portable weight indicator for use in ordinary drilling or production work will find the Clipper equal to any job. Clamped to the deadline in an instant, it gives accurate, dependable readings of weight up to 243 tons with 10 one-inch lines, and has the vernier hand for extremely sensitive readings when fishing, milling, etc. Accommodates all conventional string-ups and line sizes. Exceptionally light weight not only makes carrying easy, but eliminates tendency for the instrument to swing on the deadline in rough drilling. Since the Clipper must be read across the derrick floor, an instrument such as the "Sealtite" is desirable when greater legibility is required.

INDICADOR DE PESO CLIPPER, TIPO PORTATIL

Los perforadores que necesiten un indicador de peso de tipo portátil, firme, compacto y exacto, para uso en perforación corriente o en trabajo de producción, encontrarán en el Clipper exactamente lo que desean. Se asegura al cable muerto en un instante, y da exacta y segura lectura de peso hasta 243 toneladas con 10 líneas de una pulgada, teniendo un vernier para acusaciones de extrema sensitividad para trabajos de pesar útiles, etc. Se adapta a todas las series o cadenas corrientes y tamaño de cable. Su peso extraordinariamente liviano no sólo facilita su llevada a cualquier punto, sino que suprime también la tendencia a oscilación en el cable muerto, al tratarse de perforación dura. Como el Clipper ha de leerse a través del piso de la torre o aparejo, se recomienda un instrumento como el "Sealtite" cuando se necesite mayor legibilidad.

SLIM HOLE WEIGHT INDICATOR

The Slim-Hole is especially built to provide accurate readings of weight in all shallow field or core testing work. Capacity is 150,000 pounds with six lines, ample for most light weight jobs. Construction features include a newly-designed gauge case with built-in diaphragm unit, making the Slim Hole extremely compact and portable. A "C" clamp which operates in back of the case, permitting use of the full dial circumference, is another important feature. The clamp requires no shims or other adjustments for attaching the instrument to different size lines.

INDICADOR DE PESO "SLIM HOLE" DE AGUJERO ANGOSTO

El indicador de peso "Slim Hole" está especialmente construito para suministrar acusaciones exactas de peso en conexión con todo trabajo de sacar muestras o núcleos y otras obras similares. Capacidad de 150.000 libras con seis cables, amplia para casi todos los trabajos de peso liviano. Los rasgos de construcción incluyen una caja de manómetro de tipo perfeccionado, con unidad de diafragma intergrante, lo que hacer que el modelo "Slim-Hole" sea muy compacto y portátil. Una abrazadera en "C" que actúa al respaldo de la caja, permite el uso de un cuadrante de circunferencia completa, lo cual es otro rasgo importante. La abrazadera no requiere laminitas, cuñas u otros ajustes, para la unión del instrumentos a cables de diferentes tamaños.

SPECIAL ILLUMINATED WEIGHT INDICATOR

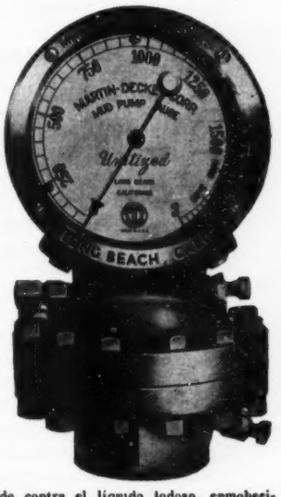
Here is a completely portable weight indicator for any job on the lease where quick installation is required. Its oversize gauge mechanism has greater capacity than any previous instrument—315 tons with a string-up of 10 one-inch lines. The vernier mechanism—six times as sensitive as the regular one—indicates the slightest weight changes on the most delicate fishing or coring jobs. Built-in illumination affords full visibility at night from any part of the rig floor. Ten quickly interchangeable dials are provided for use with all conventional string-ups and line sizes, and a "points" dial is visible at all times for those preferring to use that system. Metric dials are available. The Special clamps directly to the deadline; for close weight control an instrument such as the "Sealtite"—install d right before the driller—is recommended.

INDICADOR SPECIAL DE PESO ILUMINADO

Este es un indicador de peso completamente portátil, para cualquier trabajo en el campo, donde se requiera unarápida instalación. Su mecanismo de indicación, de tamaño extra grande, tiene mayor capacidad que todo instrumento anterior—315 toneladas con una serie de 10 líneas de una pulgada. El mecanismo de vernier, seis veces más sensitivo que el corriente—indica los más leves cambios de peso en los trabajos más delicados de pescar o sacar núcleos. Su iluminación integrante permite su visibilidad en la noche desde cualquier punto del piso de la torre o aparejo. Su suministran diez cuadrantes de rápido intercambio, para uso con todas las series o cadenas corrientes y tamaños de cables, y hay un cuadrante de "puntos", visible en todo momento, para aquellos que prefieren usar este sistema. Ofrecemos también cuadrantes en sistema métrico. El modelo Especial se asegura directamente al cable muerto. Para el exacto gobierno del peso se recomienda un instrumento como el "Sealtite"—instalado al frente del perforador.

UNITIZED MUD PUMP GAUGE

Here's a portable mud pump gauge that's far ahead of the field when it comes to accuracy, sensitivity, smoothness and ease of reading. The Unitized is installed on the pump by simply making one union connection, and accurately shows all pump pressures up to 5000 pounds. It is unaffected by heavy pulsation or vibration, and its oil-filled mechanism is fully protected against mud fluid, rust or corrosion, insuring long life and trouble-free performance on well after well. The large numerals stand out clearly from a distance of more than 30 feet, and readings can easily be made by simply noting the position of the gauge hand. Vernier retard movement covers both low and high pressure ranges with extreme accuracy, and a special damper permits adjusting the hand for overthrow. Rugged all-bronze gauge case further protects all working parts. The Unitized is furnished in one, three or five thousand pound capacities for all portable installations. When extremely accurate pressure control is required a "Sealtite" Mud Pump Gauge, mounted right in front of the driller, is recommended.



For further information on these or any other Martin-Decker Oil Field Instruments, consult your latest Composite Catalog or write direct to Martin-Decker Corporation.

MANOMETRO UNITIZED DE BOMBA DE LODO

Este es un manómetro portátil de bomba de lodo, lo mejor de su clase en lo tocante a exactitud, sensitividad, seguridad y facilidad de lectura. El Unitized se instala en la bomba sencillamente haciendo una conexión de unión, y muestra precisamente las presiones de la bomba hasta 5000 libras. Es inafectado por las violentas pulsaciones o vibraciones, y su mecanismo en baño de aceite está completamente protegido contra el líquido lodoso, enmohecimiento o corrosión, lo cual le asegura prolongada duración y funcionamiento expedito y exacto en pozo tras pozo. Los números grandes se ven claramente a una distancia de más de 30 piés, y las acusaciones pueden hacerse sencillamente observando la posición de la cabeza del manómetro. Un vernier facilita más aún la exactitud en las escalas de alta y baja presiones. Una firme caja de bronce sirve de adicional protección a las piezas del manómetro. El Unitized se suministra en capacidades de mil, tres mil y cinco mil libras, para todas las instalaciones portátiles. Cuando se requiere un gobierno de presión extremadamente preciso, se recomienda el manómetro de bomba de lodo "Sealtite", que se instala al frente del perforador.

Para información más detallada de los presentes y de otros instrumentos Martin-Decker para campos petrolíferos, consulte el Catálogo Compuesto o escriba directamente a la Martin-Decker Corporation.

BESIDES THE PRODUCTS ILLUSTRATED AND DESCRIBED ON THESE PAGES, MARTIN-DECKER MANUFACTURES THE FOLLOWING OIL FIELD INSTRUMENTS

- Measuring Line Weight Indicator
- Cement Pump Gauge
- Individual Mud Pump Gauge
- 1000 lb. Unitized Mud Pump Gauge
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- Pump Dynamometer
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the more important products synthesized from petroleum hydrocarbons. One of the oldest is isopropyl alcohol converted from propylene in cracked gas. Ethyl alcohol is made from refinery gases and can probably more than hold its own, economically, against alcohol made from grain for commercial uses. Butyl, amyl, and higher alcohols are also produced synthetically from the various portions of refinery cracked gases.

Large quantities of ethylene glycol used as an antifreeze, and diethylene glycol used for moistening cigaret tobacco, are produced from refinery gases. Ethylene dichloride from olefins is used as a constituent of rubber substitutes. Butadiene is much in the news today for its part in the production of synthetic rubber. It is prepared by dehydrogenating butylene. It is now possible to produce glycerin from petroleum commercially, a vital item in the manufacture of explosives of certain types. The chlorination of propane results finally in cyclopropane, a new anesthetic. Commercial production of nitroparaffins by nitrating gaseous paraffin hydrocarbons is of growing interest.

Metallurgy

The effect of metallurgy and the development of new steels and alloys are of greatest importance. A great many of the new processes could not be operated successfully if the special metals meeting the exacting demands were not available. Great credit is due to the developers of these metals.

As the modern refinery branches out to include alkylation, polymerization, reforming, cracking, topping, dewaxing, solvent extraction, and other processes, the diverse demands put on metals reach new highs.

Consider tube temperatures of 1200° F. or higher and accompanied by even higher pressures, as an example of the required versatility of metals. As another example of service requirements, consider the low-temperature fractionation of gases. In one installation, equipment was put into operation at temperatures approaching —200° F.

A large variety of alloying elements is used either singly or in combination to produce the desired ends. Chromium adds corrosion resistance and oxidation resistance at high temperatures. The oxidation and corrosion resistance of chrome steels can be further improved by the addition of silicon or by adding both silicon and aluminum. Silicon will retard scaling of tubes at high temperatures and aluminum is of value in decreasing the air-hardening characteristics when used in the alloy.

Molybdenum is found to be of value in improving strength at high temperatures. Carbon, columbium, tungsten, and vanadium are other elements added to increase strength. Increase of manganese and carbon content apparently increases the creep strength of carbon-molybdenum steel. The addition of chromium is reported to lower the creep strength of carbon-molybdenum steels but increases their stability. The creep strength of chromium-molybdenum steel is improved by the addition of titanium or columbium. Nickel-chromium steel is being increasingly used for liners where sulfur in the hot gases is the principal attacking agent and monel metal is used where water is present.

Thus it may be seen that a great number of possible combinations of alloys in steels can be used. The various problems imposed by corrosion, oxidation, stresses, temper embrittlement, hydrogen penetration, and impact can be solved by the addition of one or more elements in varying proportions to the steel.

Progress is being made in coating steel with various metals to reduce corrosion. A means finding favor is the spraying and coating of pressure vessels and fractionating columns with corrosion-resistant metals. In some cases chromium sheet linings are used.

Toluene

With the memory of the scramble for toluene in 1917 still fresh, a great deal of attention is now being given to its procurement and to plant production capacity. High-grade toluene is the basic raw material for producing trinitrotoluene (TNT) used as the explosive in aerial bombs and shells.

There are several sources that could be exploited for added capacity over normal production but undoubtedly the secondary choice will be the petroleum industry. Several processes are available and it is reported that one or two plants for producing toluene are now being built at large refineries.

The oldest method of producing toluene from petroleum consists of fractionation of selected crudes, followed by chemical or physical extraction. Borneo gasolines are reported to be the richest in this fraction. It is present in appreciable quantities in certain California and Arkansas (Smackover) crudes.

A second method that has been used involves high-temperature, low-pressure operation. A third method uses thermal pyrolysis of cracked gases. Propylene is reported to give the best results.

Newer methods include the catalytic aromatization of normal heptane. The heptane is recovered from crude or distillates by fractionation and is then converted to toluene by cyclization with dehydrogenation, using chromic oxide as a catalyst.

Aviation Gasoline

Aviation gasoline consumption has shown a consistent rise. The consumption of aircraft fuel in the United States for military purposes has increased from 20,000,000 gal. in 1932 to 48,000,000 gal. in 1939. Consumption by commercial airlines has increased from 24,000,000 to 60,000,000 gal. in the same period. It is also

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en la refinería o destilería.

Grandes cantidades de glicol etileno, usado como una substancia incongelable, y el glicol bietileno, usado para humedecer tabaco de cigarrillos, se producen de los gases de refinería. El bicloruro de etileno, de oleafinas, se usa como un ingrediente del caucho sintético o artificial. El butadieno aparece mucho en las noticias de hoy día, debido a su participación en la producción de caucho sintético. Resulta de la deshidronegación del butileno. Ahora es posible producir glicerina del petróleo, sobre base comercial, como un articulo vital en la manufactura de explosivos de ciertos tipos. La clorinación del propani resulta finalmente en ciclopropano, un nuesto anastésico. La producción comercial de nitroparafinas, nitratando los hidrocarburos gaseosos de parafina, es de creciente interes.

Metalurgia

El efecto de la metalurgia y el desarrollo de nuevas aleaciones de acero son de capital importancia. Un gran número de los nuevos procedimientos no podrían funcionar satisfactoriamente si no hubieran metales especiales para satisfacer las exigentes demandas implicadas en el trabajo. Gran crédito merecen, por lo tanto, los perfeccionadores de los nuevos metales.

A medida que la moderna refineria se ensancha en radio de acción, para incluir la alkalización, polimerización, reformación, desintegración o cracking, destilación primaria, desparafinación, extracción de solventes y otros procedimientos, las diversas demandas impuestas sobre los metales llegan a nuevos niveles máximos.

Consideremos, por ejemplo, las temperaturas de tubería de 1200° F. o más, acompañadas de presiones todavía más altas, y nos daremos cuenta aproximada de la versatilidad que se espera actualmente de los metales. Como otro ejemplo de requisito de servicio podriamos citar la baja temperatura que se requiere para la fraccionación de los gases. En una instalación, el equipo se sometió a temperaturas hasta de 200° F. bajo cero.

Una gran variedad de elementos de aleación se usa individualmente o en combinación para producir los resultados deseados. El cromo añade resistencia a la corrosión y oxidación a altas temperaturas. La resistencia a oxidación y corrosión de las aleaciones de acero y cromo puede aumentarse más todavía con la adición de silicio y aluminio. El silicio retarda la incrustación en la tubería, a altas temperaturas, y el aluminio es de valor en reducir las características de endurecimiento por aire, cuando se usa en la aleación.

El molibdeno se encuentra valioso en aumentar la resistencia o firmeza bajo altas temperaturas. El carbono, el columbio, el tungsteno y el vanadio son otros elementos que se añaden para aumentar la firmeza. El aumento en contenido de manganeso y carbono aparentemente incrementa la resistencia a deformación de las aleaciones de acero, carbono y molibdeno. La adición de cromo se dice que reduce la resistencia a deformación de estas últimas aleaciones de acero, pero aumenta, al mismo tiempo, su estabilidad. La resistencia a deformación de la aleación de acero, cromo y molibdeno es mejorada con la adición de titanio o columbio. La aleación de acero, níquel y cromo tiene creciente utilización en forros o revestimientos expuestos al ataque de gases calientes, y el metal monel se usa donde hay presencia de agua.

Se verá, por lo tanto, que se puede usar un gran número de posibles combinaciones de aleaciones de acero. Los varios problemas impuestos por la corrosión, oxidación, tensiones, debilidad de temple, penetración de hidrógeno e impacto o choque, pueden resolverse por la adición de uno o de más elementos en varias proporciones, al acero empleado.

Se han logrado interesantes progreso en el revestimiento del acero con capas de varios metales para reducir la corrosión. Un método de general aceptación es la aplicación, a cámaras de presión y columnas de fraccionación, de rocío y capas de metales resistentes a la corrosión. En algunos casos se emplean forros de lámina de cromo.

Tolueno

Con el recuerdo de la febril actividad en la producción de tolueno en 1917, todavía fresco en la memoria, de nuevo se está dando gran atención a su obtención y expansión de los establecimientos que lo producen. El tolueno de fina calidad es la materia prima fundamental para la producción de trinitrotolueno (TNT) usado como explosivo en bombas aéreas y otros proyectiles.

Hay varias fuentes que podrian explotarse para adicional capacidad sobre la producción normal, pero seguramente, la segunda elección será la industria del petróleo. A la disposición de la industria hay varios procedimientos, y se dice que una o dos instalaciones para la producción de tolueno se están construyendo anexas a grandes refinerías.

El método más antiguo de producir tolueno de ptróleo consiste en la fraccionación de petróleos crudos escogidos, seguida por extracción química o física. Las gasolinas de Borneo se dicen que son muy ricas en esta fracción. Está presente en cantidades apreciables en ciertos crudos (Smackover) de California y Arkansas.

Un segundo método, que se ha usado, comprende trabajo de alta temperatura y baja presión. Un tercer método se vale de la pirolisis termal de los gases desintegrados. El propileno se dice que da los mejores resultados.

Entre los nuevos métodos se comprende la aromatización catalítica del heptano normal. El heptano se recupera del crudo o de destilados, por fraccionación, y luego se convi-

interesting to note that during this period the average octane number of all aviation gasoline used by the U. S. Army Air Corps has increased from 82 to practically 100. The weighted average octane rating of fuels used by commercial airlines is estimated to have increased from 73 to 90.

Commercial 87-octane number and 92-octane number fuels used by the Army for some purposes are generally prepared by adding 3 cc. of lead per gallon to a selected high-octane-number straightrun gasoline. The high-octane blending agents used are generally isooctane, isopentane and neohexane. These are blended in various ways, incorporating straightrun 74-octane aviation material and leading to 100-octane number.

The straightrun blending stock can be made from a number of South Texas crudes which yield suitable fractions having octane numbers of 70 to 76. The process of making these stocks involves stripping the gasoline from the crude oil, removal of butane and lighter fractions from the straightrun gasoline and rerunning the debutanized stock. The use of high-pressure hydrogenation permits the making of aviation-gasoline blending stock from various cuts of nonselected crudes. These blending stocks are also made by catalytic reforming. The lower octane fuels are also reported to be made by direct leading of suitable boiling-range fractions produced on a newer unit that combines cracking and polymerization.

Isopentane is produced through fractional distillation of natural gasoline. Isooctane is produced by directly coupling butanes with isobutane using sulfuric acid alkylation. Other alkylation methods, selective polymerization and dehydrogenation and polymerization are methods used to produce isooctane. Neohexane, a newer high-octane blending stock, is produced by thermal alkylation.

Automobile Fuels

While the production of adequate quantities of aviation gasoline of 100-octane number or higher is of significance at this time, high-octane motor fuels cannot be overlooked. The bulk of gasoline production will be motor fuel and hence is important. Octane numbers continue to rise steadily; in fact, the last year has seen a greater-than-usual rise.

The use of tetraethyl lead is probably the largest single factor in higher octane numbers. The use of lead alone will no longer meet the demand and the base gasoline itself must be improved. This improvement is being brought about through more efficient thermal cracking, reforming straightrun, low-octane naphtha, polymerization and other new processes. Because of the interest of the refiner in how to cope most successfully with increased octane-number requirements of motor fuels and the nation-wide interest in aviation fuels, it is felt that a survey of the whole list of processes for high-octane-number production is timely.

Thermal Cracking

While new processes for the conversion of hydrocarbons to high-octane gasoline hold the spotlight, it should be remembered that a most substantial portion of the motor fuel produced by the industry is made in thermal-cracking units. This method of making gasoline from heavy residuums and gas oils cannot be ignored.

Thermal units may be roughly divided into liquid-phase and vapor-phase types although the line of demarcation is not clear. Liquid-phase units follow two patterns, one being of the viscosity-breaker type and the other the coking type. In the first, the charging stock is processed to make the highest gasoline yield; making at the same time a fuel-oil residuum. A thermal coking unit is operated to obtain the highest ultimate gasoline yield and to produce coke as the end product. The choice of operations is generally influenced by the market possibilities of the respective fuel oil and coke. The octane number of the gasolines produced will vary from 68 to 75, depending on the quality of the charging stock and the operating conditions, including temperature, pressures and time. Such gasoline is not suited for high-octane-number aviation fuel.

Various fractions of topped crudes do not react in the same manner to uniformly imposed operating conditions. This circumstance has given rise to the development of the modern multicoil selective cracking unit. In it the charge is divided into two or more fractions and the separated fractions are put through individual coils where the pressure, temperature and time can be controlled to give optimum results for each portion. This eliminates undercracking in some portions and overcracking in others.

Vapor-phase units vaporize the charging stock and then subject the vapors to cracking temperatures at low pressures. These units of various designs are reported to be especially successful running on selected stocks.

One of the most important phases of thermal cracking is thermal reforming. Here straightrun gasoline is converted into higher-octane fuel. This has long been a standard practice but the recent rise in octane-number requirements of motor fuels emphasizes it again. Thermally reforming the low-octane straightrun naphthas represents the quickest and easiest way to effect octane-number improvement in the total plant gasoline, although yields and quality can leave something to be desired.

The refiner with a fairly good thermal cracking unit is in a quandary when octane-number improvements are needed. New equipment and

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erte en tolueno por cristalización y deshidrogenación, usando óxido crómico como catalizador.

Gasolina de Aviacion

El consumo de gasolina de aviación ha mostrado un aumento contínuo. El consumo de combustible de aviación en los Estados Unidos de América, para fines militares, ha aumentado de 20.000.000 de galones en 1932 a 48.000.000 en 1939. El consumo, por parte de las líneas de transporte aéreo ha aumentado de 24.000.000 a 60.000.000 de galones durante el mismo período de tiempo. También es interesante anotar que durante este período de tiempo, el número octano promedio de toda la gasolina de aviación consumida por el Cuerpo de Aviación Militar Aérea de los E.U.A., ha aumentado de 82 a casi 100. El número octano de la gasolina de aviación consumida por las líneas de transporte aéreo ha aumentado de 73 a 90.

Los combustibles comerciales de número octano 87 y de número octano 92, usados por el ejército para ciertos fines, se preparan generalmente, mediante la adición de 3 cc. de plomo por galón, a una gasolina o esencia de destilación de alto número octano de clase seleccionada. Los agentes de mezcla de alto número octano que se usan generalmente son isooctano, isopentano y neohexano. Estos se mezclan de varias manera, incorporando esencia de destilación de aviación de número octano 74, y el resultado es una gasolina de número octano 100.

La esencia de destilación, que sirve de material primario, se extrae de varios petróleos crudos del sur de Texas, los cuales producen adecuadas fracciones con números octano de 70 a 76. El procedimiento de manufactura de este material incluye la destilación de la gasolina del petróleo crudo, la extracción del butano y de las fracciones más volátiles de la esencia destilada y refinación del material desbutanizado. El uso de la hidrogenación a alta presión permite hacer el material de mezcla de gasolina de aviación de varias fracciones de petróleos crudos no escogidos. Estos materiales de mezcla se hacen también por reformación catalítica. Se dice que los combustibles de menor número octano se hacen mediante la aplicación directa de plomo a fracciones de adecuada escala de ebullición producidas en una nueva instalación que comprende la desintegración y la polimerización.

El isopentano se produce mediante destilación fraccional de la gasolina natural. El isooctano se produce por acoplamiento directo de butanos e isobutano, empleando alcalización de ácido sulfúrico. También se produce el isooctano por otros métodos, incluyendo algunos de alcalización, polimerización selectiva y deshidrogenación, y polimerización simple. El neohexano, un nuevo material de mezcla de gran número octano, se produce mediante alcalización termal.

Combustibles de alto numero octano para automoviles

A pesar de que la producción de adecuadas cantidades de gasolina de aviación de número octano 100 o mayor todavía, es de suma importancia en la actualidad, no se ha descuidado la producción de combustibles de alto número octano para motores de automóviles. La mayor parte de la producción de gasolina será siempre para motores de automóviles, y por esta razón, su importancia no decaerá. Los números de octano continúan en aumento, y el año pasado, presenció, en efecto, el mayor incremento en este sentido.

El uso del tetraetilio de plomo es problemente el principal factor simple en los mayores números octano. El uso de plomo solo no podrá más satisfacer la memanda, y la misma gasolina básica deberá mejorarse. Este mejoramiento se está realizando mediante una desintegración o cracking termal más eficaz, reformación de la esencia de destilación, nafta de bajo número octano, polimerización y otros nuevos procedimientos. Debido al interes del refinador en cómo resolver con éxito los requisitos del mayor número octano de los combustibles de motor, y en vista del interes nacional en combustibles de aviación, creemos que será oportuno dar aquí una revista, aunque sea breve, de los varios procedimientos que se usan para obtener la producción de alto número octano.

Desintegracion o cracking termal

A pesar de que los nuevos procedimientos para la conversión de hidrocarburos en gasolina de alto número octano están monopolizando la atención de los refinadores, es bueno recordar que una gran parte del combustible de motor producido por la industria se hace en instalaciones de desintegración termal. No se puede ignorar este método de hacer gasolina de residuos pesados y gas de petróleo.

Las instalaciones termales pueden dividirse, en términos generales, en tipos de fase líquida y de fase de vapor, a pesar de que la línea de demarcación no es clara. Las instalaciones de fase líquida siguen dos formas, la de tipo de separación de viscosidad y la del tipo de coquificación. En el primero, el material de carga se trata de modo de obtener el mayor rendimiento posible de gasolina, produciendo, al mismo tiempo un residuo de petróleo combustible. La instalación de coquificación termal sirve, por su parte, para obtener el mayor rendimiento posible de gasolina y producir coque como producto final. La elección de operaciones es generalmente influenciada por las posibilidades del mercado del petróleo combustible y del coque. El número octano de la gasolina producida varía de 68 a 75, dependiendo de la calidad del material de

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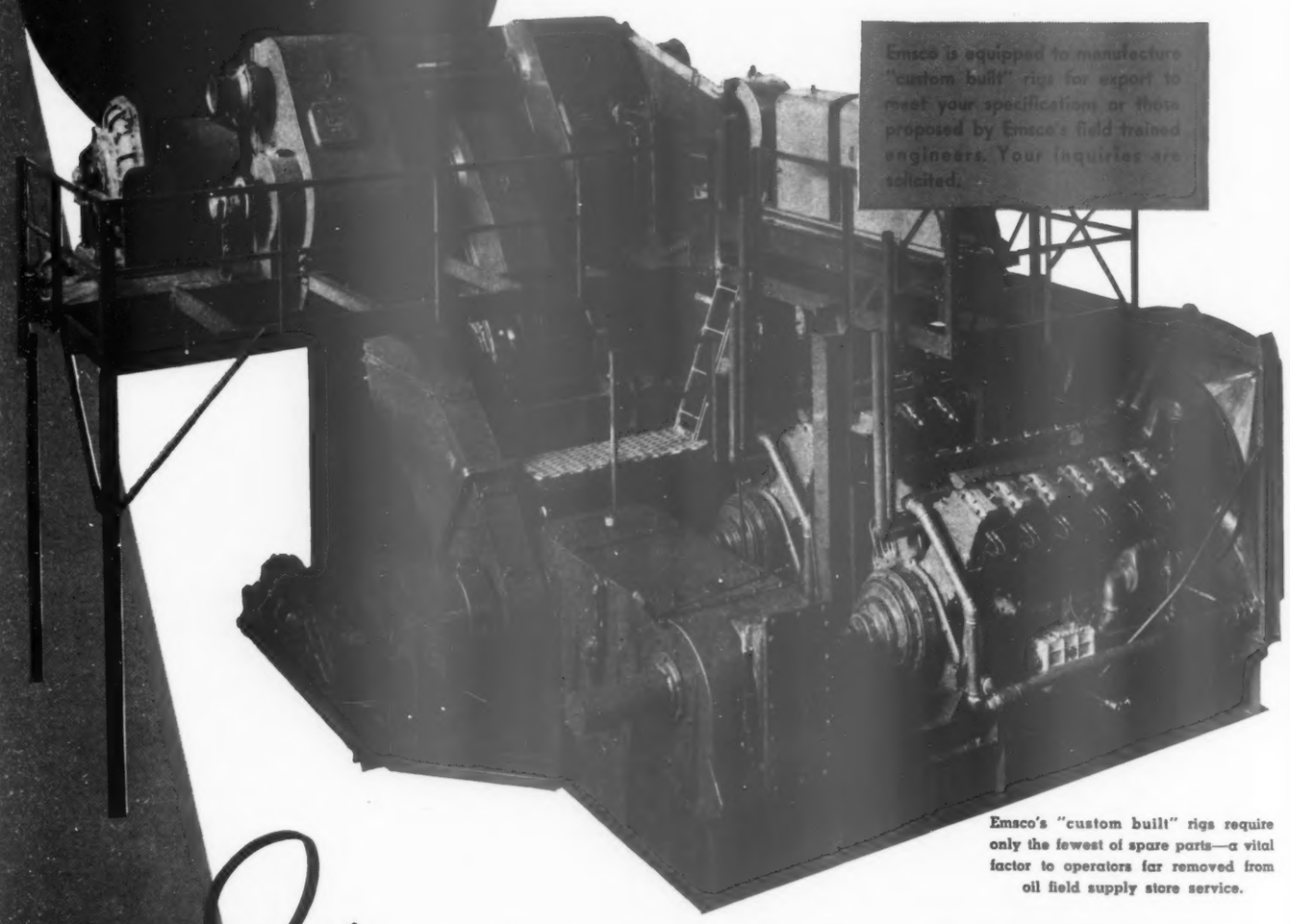
EMSCO'S CUSTOM BUILT RIGS..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(Continued from Page 231)

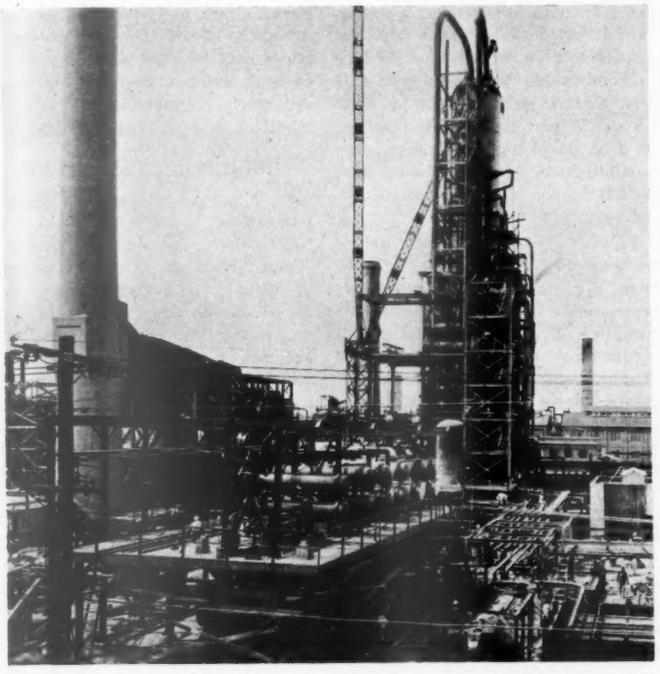
writeoffs are expensive. The thermal reforming of straightrun naphtha or gasoline is costly because of the poor recovery. Fortunately some help is now available in the latter case. Small, inexpensive polymerization plants are obtainable that will permit recovery of additional gasoline of blending value from the otherwise waste gases.

One advantage of thermal reforming is that the gasoline produced is of relatively high volatility. Straightrun naphtha can be dehydrogenated catalytically to produce a high-octane, desulfurized blending stock but the change in boiling range is much less pronounced than with thermal reforming. The change to such a process has to be considered in the light of the effect on the volatility balance of the plant.

A recent addition to the refining industry is the Polyform process. This differs from ordinary thermal cracking in that the raw charging stock is processed in admixture with varying amounts of normally gaseous hydrocarbons, such as propanes and butanes, and in that admixture the oil is subjected to higher temperatures and higher degrees of conversion per pass than would be possible under otherwise similar conditions without excessive coke formation in the cracking tubes. The process results in higher gasoline yields and in higher octane number than is normally obtained when the same stock is put through a conventional thermal-cracking unit.

The operation can be applied to all types of thermal-cracking operations, including reforming, gas-oil cracking, vis-breaking, coking, or complete combination crude cracking. Of particular interest is the possibility to convert 20 to 30-octane-number naphtha stock to 76 to 82-octane-number gasoline with high yields. The gasolines produced are reported to have high octane numbers with road-octane appreciation of from 3 to 8 numbers, appreciation from C.F.R.-A.S.T.M. octane to Research octane of 9 to 14 numbers, high blending values, excellent distillation characteristics and good lead susceptibility.

With modified operations the process can be made to produce a distillate with an octane number of from 80 to 84, preferably using gasoline, naphtha, kerosene, or light furnace oil as charging stock. The cracked distillate is highly aromatic and can be acid-treated to produce aviation gasoline of 90-octane number with less than 3 cc. of lead per gallon and an 80-octane-number aviation safety fuel with boiling range between 300° F. and 425° F. The aromatic content of the distillate, particularly toluenes and xylenes, is high, and these fractions may be readily concentrated by distillation.



Construction view of 25,000-bbl. topping plant at the Port Arthur, Tex., refinery of the Texas Co.

Vista de la construcción de la instalación de la destilería de gasolina pura, de 25.000 barriles, en la refinería en Port Arthur, Texas, de la Texas Company

Catalytic Cracking

The recently developed methods of cracking heavier fractions of crude by catalytic methods have resulted in the production of gasolines of much higher octane number. By the use of ethyl fluid and through proper blending, 100-octane-number gasoline, meeting aviation requirements, can be made. There are several commercial processes in operation using various activated clays, either synthetic or natural, as catalysts. Conditions of temperature and pressure are generally moderate.

The Houdry catalytic-cracking

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carga y condiciones de operación, incluyendo temperatura, presiones y tiempo. Semejante gasolina no es adecuada, como combustibles de aviación de alto número octano.

Varias fracciones de petróleos crudos destilados no reaccionan de la misma manera a condiciones de operación uniformemente impuestas. Esta circunstancia ha dado lugar al desarrollo de la moderna instalación de desintegración selectiva de múltiple alambique. En ella, la carga se dividide en dos o más fracciones, y las fracciones separadas se pasan por alambiques o serpentines individuales, donde la presión, temperatura y tiempo pueden gobernarse para producir resultados óptimos para cado porción. Esto suprime la subdesintegración de ciertas porciones y la sobredesintegración de otras.

Las instalaciones de fase de vapor evaporan el material de carga y somete luego los vapores a temperaturas de desintegración a bajas presiones. Estas instalaciones de varios tipos, se dice que están dando muy satisfactorios resultados con materiales escogidos.

Una de las fases más importantes de la desintegración termal es la reformación termal. Aquí, la gasolina destilada es convertida en combustible de mayor número octano. Desde hace tiempo, esto ha sido práctica corriente, pero la reciente demanda de mayor número octano para los combustibles de motor, le ha impartido renaciente importancia. La reformación termal de las naftas de bajo número octano representa la manera más rápida y fácil de mejorar el número octano, a pesar de que el procedimiento deja algo que desear en lo tocante a calidad y rendimientos.

El refinador con una instalación termal regularmente buena no sabe exactamente cuando se necesitan mejoramientos del número octano. El equipo nuevo cuesta dinero. La reformación termal de la nafta o gasolina destilada es costosa a causa de la reducida recuperación. Por suerte, cierta ayuda se presenta ahora para este último caso. Al presente hay a la disposición de los refinadores instalaciones pequeñas y relativamente económicas de polimerización, que permiten la recuperación de adicional gasolina de valor de mezcla, de los gases que de otro modo se desperdiciarían.

Una ventaja de la reformación termal es que la gasolina producida es de alta volatilidad, relativamente hablando. La nafta destilada puede deshidrogenarse cataliticamente para producir un material de mezcla de alto número octano, desulfurado, pero el cambio en escala de ebullición es mucho menos pronunciada que en el caso de la reformación termal. El cambio a semejante procedimiento tendrá que estudiarse desde el punto de vista del efecto sobre el factor de volatidad de la instalación.

Una reciente adición a la industria de la refinería es el procedimiento proliformo. Este se diferencia de la desintegración termal ordinaria en que el material crudo de carga se trata en forma mezclada con cantidades variables de hidrocarburos normalmente gaseosos, como propanos y butanos, y en que en esa mezcla, el petróleo se somete a mayores temperaturas y más altos grados de conversión, por paso que los que se serian posibles bajo otras condiciones similares, sin excesiva formación de coque en la tubería. El procedimiento resulta en mayores rendimientos de gasolina y en mayor número octano que el obtenido normalmente cuando el mismo material se pasa por una instalación de desintegración de tipo ordinario.

La operación puede aplicarse a todos los trabajos de desintegración termal, incluyendo reformación, desintegración de petróleo gaseoso, separación, coquificación o desintegración de crudos en combinación completa. De particular importancia es la posibilidad de convertir material de nafta de número octano 20 a 30, en gasolina de número octano 76 a 82, con gran rendimiento. Las gasolinas producidas se dicen que tienen altos números octanos, con apreciación de octano—camino de 3 a 8 número, apreciación de C.F.R.-A.S.T.M. de octano a octano de estudio de 9 a 14 números, altos, valores de mezcla, excelentes características de destilación y buena susceptibilidad al plomo.

Con operaciones modificadas, el procedimiento puede adaptarse a la producción de un destilado con un número octano de 80 a 84, usando preferiblemente gasolina, nafta, kerosene o petróleo liviano de quemar, como material de carga. El destilado desintegrado es muy aromático y puede tratarse con ácido para producir gasolina de aviación de número octano 90 con menos de 3 cc. de plomo por galón, y un combustible de aviación de seguridad de número octano 80, con escala de ebullición entre 300 y 425° F. El contenido aromático del destilado, representado particularmente por toluenos y xilenos, es alto y estas fracciones pueden concentrarse facilmente por destilación.

Desintegracion catalitica

El método recientemente perfeccionado, de desintegrar las fracciones más pesadas del petróleo crudo, por desintegración catalítica, ha resultado en la producción de gasolinas de mucho mayor número octano. Mediante el uso de etilio líquido y por mezclas adecuadas, puede hacerse una gasolina de número octano 100, que satisface los requisitos de los motores de aviación. Hay varios procedimientos comerciales en funcionamiento, que se valen de varias arcillas activadas, sintéticas o naturales, como catalizadores. Las condiciones de temperatura y preciones son generalmente moderadas.

El procedimiento de desintegración catalítica de Houdry es de interes en vista del gran número de instalaciones que se han hecho ultimamente, muchas de las cuales están

process is of interest because of the large number of units recently installed and now operating. The process involves heating, tar removal, conversion in contact with the catalyst, and final fractionation with subsequent finishing. The catalyst is regenerated by burning off the carbon deposits with the aid of preheated air. The flue gases from the case being regenerated pass to another case and are further burned to eliminate carbon monoxide and oil vapor. The heat of regeneration is absorbed by circulating molten salt.

Aviation gasoline produced by the Houdry method involves acid treating, sweetening, and redistilling to end point in order to meet the acid-heat, oxidation, and gum requirements. The addition of 2 to 4 cc. of lead will give a fuel of 87 to 92-octane number. When blended with 25 per cent isooctane and leaded with less than 3 cc. of lead, aviation fuel of 100 Army Method octane number is made.

The manner of handling the catalyst for regeneration is a matter of great concern. Regeneration is exothermic while, of course, heat has to be put into the feed stock. The Houdry process requires regeneration of the catalyst in place and the system used for carrying away the heat and later utilizing as much of it as possible represents a substantial portion of the investment. One idea for handling the catalyst is to carry it on a moving bed through the reaction zone and then regenerate outside the unit. Another is to use a rugged catalyst and to regenerate in place with controlled amounts of flue gas and air. Again, powdered catalyst accompanies the oil as it flows through the reaction zone and is subsequently separated and regenerated outside the unit.

Possibly of greater interest, particularly to the smaller refiner, is the possibility of octane-number improvement through catalytic reforming of straightrun gasoline. Supplanting thermal cracking with catalytic cracking means a gain of 8 or 10 octane numbers on part of the total gasoline production. Catalytic reforming, or dehydrogenation, can make an increase of 20 or more numbers on the octane rating of a substantial portion of the total gasoline output of the plant.

The Houdry process is reported as adaptable to catalytic reforming. The Kellogg process uses either natural or synthetic catalysts and the Phillips process uses a bauxite catalyst. In the latter process it is claimed that naphthas can be treated to increase octane numbers by as much as 25, with some 90 per cent recovery.

Several Hydroform units are being built. This unit involves catalytic reforming with the reaction taking place in an atmosphere of hydrogen which is recovered to a certain extent and recirculated. Hydrofining involves the same equipment and is reported to be a relatively mild treatment of cracked gasolines for further improvement.

At the present time specifications for aviation gasoline precludes the use of aromatics. The number of isoparaffins is limited so that the easiest way to increase quickly the volume of aviation gasoline at low cost would be to use the aromatic types. The principal source of the high-octane, highly aromatic type fuel would be catalytic cracking and catalytic reforming. It is true that 100 octane-number fuels as now constituted would not be matched. However, if developed, it would be necessary to build aircraft engines designed to take full advantage of the highly aromatic fuels.

Thermal Polymerization

Polymerization can be described roughly as the joining of two or more hydrocarbon molecules to form one molecule having a longer carbon chain and a higher boiling point. Actually, polymerization occurs in many reactions, but as generally applied here, means the practice of converting hydrocarbons having four carbon atoms or less to the molecule into products largely in the gasoline boiling range. The process is carried out either thermally or catalytically.

Thermal polymerization is not selective in character and hence fractionation and preparation of the charge into a single olefin are not practiced. The gasoline resulting from the operation is generally around 80-octane number, with a high blending value, and is used for blending with other motor-fuel constituents.

In the Pure process, still gases are led into a heating coil and then passed at proper temperature into reaction coils. Close control of temperatures is necessary as the reaction is exothermic in character so that the reaction coils are usually equipped for quenching as well as heating.

The Polyco process is also used for thermal polymerization. Various refinery gases, including those with three-carbon and four-carbon molecules from the stabilizer, are used as feed. As in all processes, the sulfur is removed by chemical means. The charging stock is subjected to about 1,800 lb. pressure and 1,000° temperature for conversion.

By varying conditions in the thermal polymerization process, a number of products can be made. Using high temperatures and low pressures, a large proportion of aromatics can be made, including benzene, toluene, and xylene. Some plants are used primarily for the production of olefins and aromatics for further chemical uses. Because of the war situation, consideration is given to conversion of still other units to the production of toluene.

A further advantage of thermal polymerization is that it is adaptable to use with butane and propane produced from natural gas. There is a large supply of these saturates available and their conversion into

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ya funcionando. El procedimiento comprendo calentamiento, extracción de brea o alquitrán, conversión en contacto con el catalizador y fraccionación final con subsiguientes acabados. El catalizador es regenerado quemando los depósitos de carbón mediante la ayuda de aire precalentado. Los gases de la tubería de la cámara que se está regenerando, pasan a otra cámara donde se queman más para la eliminación del bióxido de carbono y vapor de petróleo. El calor de la regeneración es absorbido por circulación de sal derretida.

La gasolina de aviación, producida por el método de Houdry, incluye tratamiento de ácido, tratamiento a plumbito, redestilación para responder a los requisitos de acidez, temperatura, oxidación y gomosidad. La adición de 2 a 4 cc. de plomo produce un combustible de número octano 87 a 92. Cuando se mezcla con isoooctano de 25 por ciento y con menos de 3 cc. de plomo, produce un combustible de aviación de número octano 100 de acuerdo con los requisitos del ejército.

La manera de manejar el catalizador para la regeneración es cosa de suma importancia. Por supuesto, la regeneración es exotérmica, mientras se aplica el calor al material de alimentación. El procedimiento de Houdry requiere la generación del catalizador en su punto, y el sistema usado para llevarse el calor y utilizarlo más tarde lo más que se pueda. representa una buena parte de la inversión. Una idea para el manejo del catalizador es llevarlo en un lecho movible por la zona de reacción y luego regenerarlo afuera de la instalación. Otro es usar un catalizador firme y regenerarlo en su punto con cantidades gobernadas de gas de tubería y aire. Otro es aplicar un catalizador pulverizado, para acompañar al petróleo mientras va pasando por la zona de reacción, para ser separado y regenerado después afuera de la instalación.

Posiblemente, de mayor interes, particularmente para las refinerías pequeñas, es la posibilidad de mejor el número octano por la reformación catalítica de la gasolina destilada o esencia de destilación. La suplantación de la desintegración termal por la desintegración catalítica, significa una ganancia de 8 o 10 en número octano, en parte de la producción total de gasolina. La reformación catalítica o deshidrogenación puede producir un aumento de 20 o más números de octano en una buena parte de la producción total de gasolina de la refinería.

Se dice que el procedimiento de Houdry se adapta a la reformación catalítica. El procedimiento de Kellogg usa catalizadores naturales o sintéticos y el procedimiento de Phillips se vale de un catalizador de bauxite. En este último procedimiento se dice que las naftas pueden tratarse para aumentar los números octanos hasta 25, con una recuperación de 90 por ciento.

Se están construyendo varias instalaciones de hidroforma. Esta instalación comprende la reformación catalítica, produciéndose la reacción en una atmósfera de hidrógeno, la cual se recupera, hasta cierto punto y se recircula.

Actualmente, las características de la gasolina de aviación preclude el uso de aromáticos. El número de isoparafinas es limitado, de modo que la manera más fácil de aumentar rapidamente la cantidad de gasolina de aviación, a bajo costo, sería el uso de los tipos aromáticos. La fuente principal del combustible de alto número octano, de tipo bien aromático, sería la desintegración catalítica y la reformación catalítica. Cierto es que los combustibles con número octano 100, tal como están actualmente constituidos, no podrían hermanarse. Sin embargo, en caso de que se desarrollaran, se presentaría la necesidad de construir los motores de aviación de modo que sacaran provecho máximo de los combustibles de tipo bien aromático.

Polimerizacion termal

En términos generales, la polimerización es la unión de dos o más hidrocarburos, para formar una molécula que tenga una cadena más larga de carbono y un mayor punto de ebullición. En realidad, la polimerización ocurre en muchas reacciones, pero en la forma general que se aplica aquí, significa la práctica de convertir hidrocarburos con cuatro átomos de carbono o menos. por molécula, en productos que se comprenden principalmente en la escala de ebullición de la gasolina. El procedimiento se realiza termal o cataliticamente.

La polimerización termal no es selectiva en caracter, y por esta razón no se practican la fraccionación y la preparación de la carga en una sola oleafina. La gasolina que resulta de la operación es generalmente alrededor del número octano 80, con un alto valor de mezcla, y se usa para mezclarla con otros constituyentes de combustibles de motor.

En el procedimiento Pure, los gases de alambique se conducen a un serpentin de calentamiento y se pasan luego, a temperaturas adecuadas, a serpentines de reacción. Un exacto gobierno de temperatura es necesario, a causa de que la reacción es exotérmica en caracter, y por esta razón, los serpentines de reacción están generalmente equipados para enfriamiento y calentamiento, al mismo tiempo.

El procedimiento Polyco se usa también para la polimerización termal. Varios gases de refinería, incluyendo aquellos con tres y cuatro moléculas de carbono, del estabilizador, se usan como alimentación. Como en todos los procedimientos, el azufre se quita por algún medio químico. El material de carga se somete a una presión de como 1.800 libras y una temperatura de 1.000° F. para la conversión.

Variando las condiciones en el procedimiento de polimerización termal, pueden hacer varios productos. Usando altas temperaturas y bajas

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LA PRIMERA ELECCION
de la industria refinadora

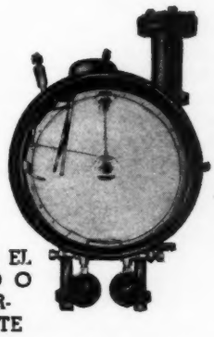
Las refinerías de petróleo de la América del Sur y del Norte han instalado más instrumentos fabricados por la Foxboro que los de todo otro fabricante del ramo. La experiencia muestra que estos instrumentos suministran máxima exactitud y sensitidad con atención mínima. Desde los sencillos indicadores hasta los reguladores completamente automáticos, los instrumentos Foxboro representan los productos más perfeccionados de su clase. Pídanos información sobre el tipo de instrumento que Vd. necesita.

PARA LA TEMPERATURA

Los reguladores potenciómetros registradores Foxboro reflejan la superior pericia técnica que originara los sistemas Stabilog de gobierno por válvulas de estrangulación para los procedimientos contínuos. La Foxboro ofrece otros tipos de reguladores de temperatura, registradores e indicadores de superior calidad para todo trabajo de refinería dependiente de calor.

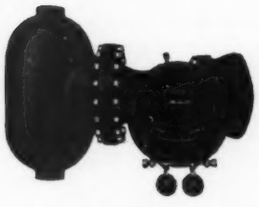
PARA LA PRESION

Cualquier procedimiento bajo presión puede medirse, registrarse o gobernarse continuamente, con exactitud extrema, mediante los instrumentos de presión Foxboro especialmente proyectados para este fin. Ofrecemos reguladores registradores y sin registro.



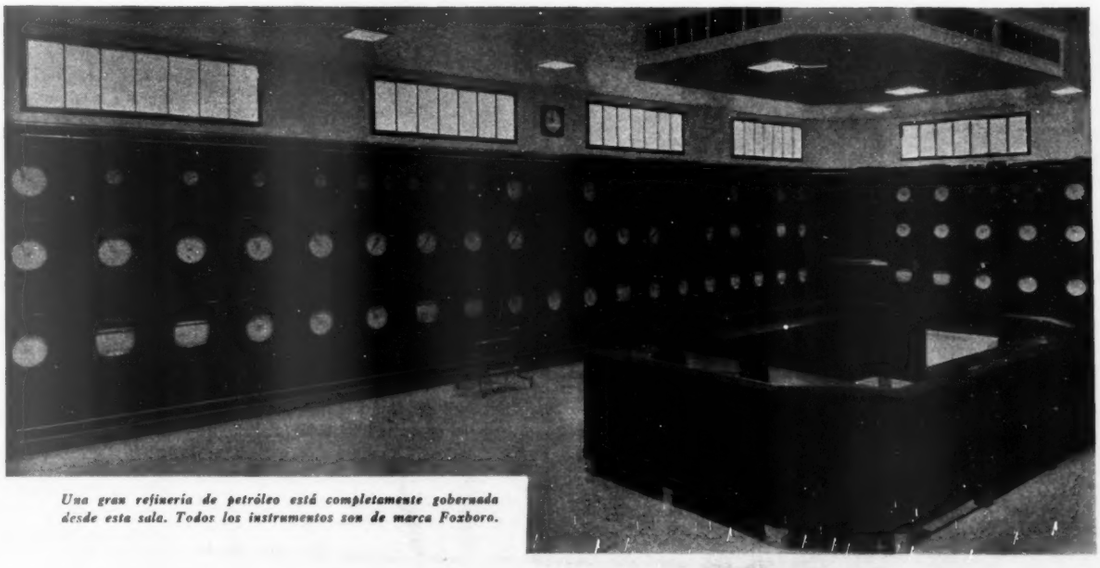
PARA EL FLUJO O CORRIENTE

Los registradores de corriente Foxboro son irreprochables para la medición contínua de gases o líquidos. Funcionan con suma exactitud por años, sin exigir recalibración. Los reguladores de corriente Foxboro son la norma para la regulación de la corriente de gas, petróleo y gas en las refinerías.



PARA NIVEL DE LIQUIDOS

Foxboro ofrece un surtido completo de instrumentos de precisión para medir, registrar o gobernar el nivel del líquido en receptáculos descubiertos o tapados. Los reguladores de registro y de indicación se ofrecen con gobiernos de todo tipo práctico.



Una gran refinería de petróleo está completamente gobernada desde esta sala. Todos los instrumentos son de marca Foxboro.

FOXBORO
REG. U. S. PAT. OFF
Instruments

THE FOXBORO COMPANY,
60 Neponset Avenue,
Foxboro, Mass., U.S.A.

LEOPOLDO SOL & CO.
Buenos Aires, Argentine
WILLIAM A. POWE
Havana, Cuba
NEAL & MASSY ENGR. CO., LTD.,
Port-of-Spain, B.W.I., Trinidad
GLOSSOP & COMPANY
Rio de Janeiro and Sao Paulo, Brazil

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motor fuels adds to the potential supply.

Catalytic Polymerization

The catalytic polymerization process, as the name implies, uses a catalyst to convert the light unsaturated hydrocarbons into gasoline or fractions that can be converted into isooctane and aviation gasoline of 100-octane number. The processes operate under less drastic pressure and temperature conditions than thermal polymerization designs, although only the unsaturates react. In considering a choice, the desire to make high-octane aviation gasoline would favor the catalytic type. If only normal or medium-octane motor fuel is to be made, a comparison must consider the fact that dehydrogenation is an integral part of the thermal polymerization unit.

The catalytic unit can be selective in operation producing isooctane which can subsequently be hydrogenated to isooctane, or nonselective in character for a greater yield of high-octane-number motor fuel. Possibly a plant built at this time would be selective in character, but would operate for motor-fuel production without hydrogenation. However, such a plant would be available for aviation gasoline production as the demand develops.

Isooctane is being produced by one large company, using two methods. One method employs cold sulfuric acid as a catalyst. The charge is mixed with 60 to 70 per cent acid at a temperature of 20° to 35° C. and contacted countercurrently. Selective absorption into the acid phase is made, the amount depending on the strength of acid and temperature. When the acid phase becomes saturated, it is separated and passed through the polymerization coil. After 1 minute at 100° C. the butylene is polymerized to isooctene. The isooctene is then hydrogenated to isooctane and is then used in aviation fuel.

The second method effects polymerization, using hot acid as a catalyst. In one plant, the cracked and reformed gasolines pass to depentanizing columns where pentane and lighter fractions pass overhead. This cut then passes to a depropanizing column. The bottoms are charged to a debutanizer where the four carbon compounds are taken overhead. After removal of the mercaptans, the fraction is ready for the hot-acid polymerization. The reaction is carried out at about 60° C. An octene fraction is recovered which is then hydrogenated to technical isooctane, and goes into aviation gasoline of 100-octane number.

The U.O.P. isooctane process is selective in action, polymerizing the normal and isobutenes contained in a butane-butene mixture to isooctene. The isooctenes are catalytically hydrogenated to isooctane. Octane numbers of 93 to 97 are reported and the fraction makes a suitable blending stock for high-quality aviation fuel. The process involves caustic washing of the feed, heating to about 325° F. under a pressure of 600 to 800 lb. per sq. in., and passing through a tower containing solid phosphoric acid catalyst. The polymer product passes to a tower where the isooctenes are separated.

The Polyco catalytic polymerization process works on the unsaturates, principally propylene and butylene in the feed. The process is also selective, so by charging a butane-butylene fraction, under carefully controlled conditions, a technical grade of isooctane can be subsequently produced for use in blending 100-octane-number aviation gasoline.

The Houdry process is adaptable to catalytic polymerization using a catalyst reported to be of aluminum hydrosilicate composition. Polymer

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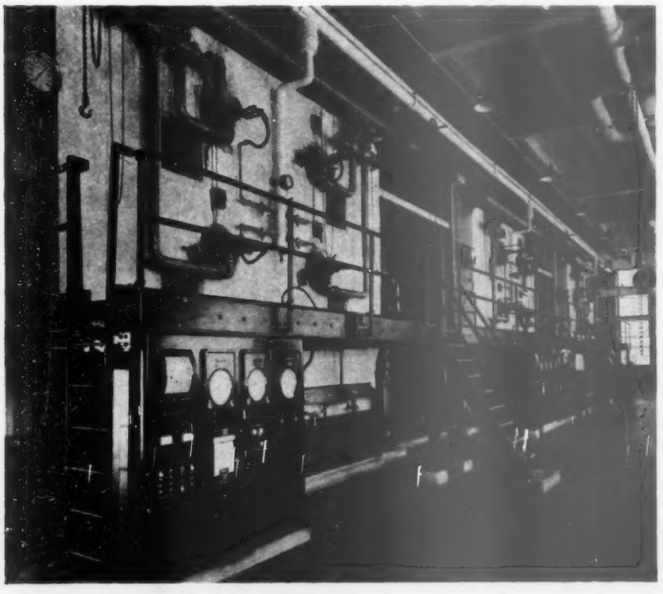

Firing aisle in the Texas Co.'s new power plant at Port Arthur, Tex.

Corredor de la nueva central de fuerza de la Texas Company en Port Arthur, Texas

(Continue desde Pagina 236)

presiones, se obtiene una gran proporción de aromáticos, incluyendo bencina, tolueno y xileno. Algunas instalaciones se usan principalmente para la producción de oleofinas y aromáticos, para adicionales usos químicos. Debido a la situación de guerra, se está dando consideración a la conversión de otras instalaciones más a la producción de tolueno.

Una adicional ventaja de la polimerización termal es que se adapta al uso con butano y propano producidos de gas natural. Hay un gran abastecimiento de estos saturados a la disposición de las refinerías y su conversión en combustibles de motor aumenta mucho el abastecimiento potencial.

Polimerizacion catalitica

El procedimiento de polimerización catalítica, como lo implica el nombre, usa un catalizador para convertir los hidrocarburos livianos insaturados, en gasolina o en fracciones que pueden convertirse en isooctano y gasolina de aviación de número octano 100. El procedimiento se desarrolla bajo condiciones menos drásticas, en lo tocante a presiones y temperaturas, que el procedimiento de polimerización termal, a pesar de que sólo los insaturados quedan sujetos a reacción. Al considerar una elección, el deseo de hacer gasolina de aviación de alto número octano favorecerá al tipo catalítico. Si sólo un combustible de número octano normal o mediano es lo que se desea producir, la comparación deberá entonces considerar el hecho de que la deshidrogenación forma parte integrante de la instalación de polimerización termal.

La instalación catalíta puede ser selectiva en operación, produciendo isooctano que subsiguientemente podrá hidrogenarse para convertirse en isooctano o de caracter no selectivo para un mayor rendimiento de combustible de motor de alto número octano. Posiblemente una instalación construida al presente sería selectiva en caracter, pero operaría para producción de combustible de motor sin hidrogenación. Sin embargo, semejante instalación quedará aprovechable para la producción de gasolina de aviación cuando se presentara la demanda.

Una gran compañía, ateniéndose a dos métodos, está produciendo isooctano. En un método emplea ácido sulfúrico frío como catalizador. La carga se mezcla con 60 a 70 por ciento de ácido a una temperatura de 20 a 35° C. y se somete a contacto de corriente contraria. Se produce entonces absorción selectiva en la fase de ácido, dependiendo la cantidad de la fortaleza del ácido y la temperatura. Cuando la fase de ácido se satura, es separada y pasada por un serpentín de polimerización. Después de un minuto a 100° C., el butileno se polimeriza en isooctено. Luego el isooctено, por hidrogenación, se convierte en isooctano, el cual se usa en el combustible de aviación.

El segundo método efectúa polimerización usando ácido caliente como catalizador. En una instalación, las gasolinas desintegradas y reformadas pasan a torres depantanizadoras, donde el penano y otras fracciones volátiles salen por arriba. Estas fracciones pasan luego a una torre o columna depropanizadora. Los fondos se cargan en un debutanizador, donde los compuestos de cuatro carbonos salen por arriba. Después de quitados los mercaptanos, la fracción queda lista para la polimerización con ácido caliente. La reacción se efectúa a más de 60° C. Se recupera una fracción de octene, la cual es hidrogena a isooctano técnico, el cual entra en la gasolina de aviación de número octano 100.

El procedimiento U.O.P. de isooctano es selectivo en acción, polimerizando los isobutanos normales contenidos en una mezcla de butano y butene, en isooctene. Los isooctenes se hidrogenan catalicamente en isooctanos. Se dice que la fracción produce números octano de 92 a 97 y que constituye un adecuado material de mezcla para combustible de aviación de primer orden. El procedimiento comprende el lavado cáustico de la alimentación, calentándola a cerca de 325° F. bajo una presión de 600 a 800 libras por pulgada cuadrada, y pasándola por una torre que contiene ácido fosfórico sólido, como catalizador. El producto polímero pasa a una torre donde se separan los isooctenes.

El procedimiento de polimerización catalítica Polico actúa sobre los insaturados, principalmente el propilene y el bitilene en la alimentación. El procedimiento es también selectivo, de modo que cargando una fracción de butano-butileno, bajo condiciones cuidadosamente reguladas, puede después producirse un isooctano de superior clase técnica, para uso en la mezcla de gasolina de aviación de número octano 100.

El procedimiento de Houdry se adapta a la polimerización catalítica, usando un catalizador, que según se dice, es una composición de hidrosilicato de aluminio. Se obtiene una gasolina polímera de número octano 85, con buena conversación por paso. Por otra parte, operando en un material escogido, se hace una conversión a isooctene, adaptado a hidrogenación para formar isooctano y otros combustibles de aviación de elevado número octano.

Finalmente establecido en el campo de la polimerización para hacer mezclas de alto número octano, para combustibles de motor, se halla el procedimiento de polimerización catalítica U.O.P. Operando a temperaturas moderadas, pero a mayores presiones, estas instalaciones están convirtiendo porciones de gases de escape de refinería en gasolinas de elevados valores en número octano.

En el campo de la polimerización para la producción de material de mezcla para combustible de motor, una reciente instalación, bajo permiso de la Polymerization Process Corp., es de particular interes. La

(Continue en Pagina 244)

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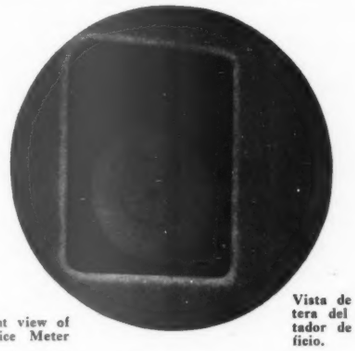

Front view of Orifice Meter

Vista de lantera del contador de orificio.

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New CBV Regulator
Nuevo regulador CBV

1379

(Continued from Page 240)

gasoline of reported 85-octane number is obtained with good conversion per pass. Again, operating on a selective charging stock, a conversion to isooctene is made, suitable for hydrogenation to isooctane and other high-octane-number aviation fuels.

Firmly established in the polymerization field for making high-octane blending stocks for motor fuels, is the U.O.P. catalytic polymerization process. Operating at moderate temperatures, but at higher pressures. these units are converting portions of waste refinery gases into gasolines of extremely high-octane blending values.

In the field of polymerization for production of motor-fuel blending stock, a recent installation, licensed by the Polymerization Process Corp., is of interest. The unit uses copper pyrophosphate as the catalyst. It is stated that 84-octane-number gasoline, having a blending value of 95 and with at least 95 per cent boiling at 400° F., is produced. Between 80 and 85 per cent conversion is reached.

The feed is an overhead cut from a stabilizer operating on cracked gasoline and containing a minimum of pentane. The feed is caustic washed and charged to the reactors at 900 lb. pressure and 415° F. Since the polymerizing reaction is exothermic, the temperature is controlled to a constant figure by means of recycling the light products separated in the depropanizer. The polymer and other products are separated by suitable fractionation.

Catalytic Hydrogenation

Hydrogenation in commercial processes now in operation is always accomplished catalytically. The process adds hydrogen to the molecule and may or may not be destructive of the molecule. In the destructive phase, cracking or rupturing of the hydrocarbon chain is practiced, followed by the addition of hydrogen at points where the breaks have occurred. In the nondestructive phase, unsaturates are charged and the hydrogen joins the molecule so there is little or no change in the boiling range. Nondestructive hydrogenation is generally carried out at low temperatures and low pressures, while the destructive type is accomplished at high temperatures and pressures.

Hydrogenation was introduced by the Standard Oil Co. of New Jersey same years ago, but due to the relatively high investment required and high operating costs, the process has not become generally used. It is now employed to produce some special naphthas that are able to command selling prices commensurate with costs. It is now of special interest because these naphthas are suitable for aviation-fuel blending. A typical aviation-naphtha hydrogenation plant will make conversions of 50 to 75 per cent per pass, yielding 75 to 78-octane-number hydrogenated naphtha having good stability, low sulfur content, and high lead susceptibility.

The U.O.P. isooctane process makes use of catalytic hydrogenation in making isooctane. The isooctene fraction made by catalytic polymerization has an octane number of about 83 and is hydrogenated to isooctane of about 96-octane rating.

The Shell process hydrogenates isooctene to isooctane using a catalyst of reduced nickel. Temperatures of 390° F. and pressures of around 60 lb. are used.

Catalytic Dehydrogenation

Nondestructive dehydrogenation is carried out catalytically and involves removing hydrogen without the cracking. This usually does not materially affect the boiling range.

Some plants are using thermal dehydrogenation of the destructive type to convert butanes from natural gas into butenes and similar products. Temperatures up to 1,150° F. and pressures to 1,000 lb. are used. However, the process is not selective.

Catalytic methods are of interest because they are selective. One recently announced process obtains 72 per cent isobutene from isobutane at around 1,100° F. Propane is dehydrogenated at somewhat higher temperatures. The catalyst is specially prepared aluminum oxide activated by a variety of materials including iron and zinc oxides, chromium oxide, and reduced nickel.

Another process effects dehydrogenation using an alumina-chromic oxide catalyst and it is stated that it yields up to 95 per cent of isobutene from isobutane. Low pressures, around 15 lb., and temperatures up to 1,400° F. are used. The butenes can be polymerized to isooctene, which can be hydrogenated catalytically to isooctane, using the hydrogen produced in the first phase. It can be seen that catalytic dehydrogenation is of great importance since it makes possible the conversion of saturates into isooctane, that indispensable blending stock for the production of high-octane-number aviation fuels.

Catalytic Alkylation

Alkylation is of extreme importance just now because of its use in producing isooctane and 100-octane-number aviation fuels. Alkylation, in effect, deprives a saturated hydrocarbon of a hydrogen atom and then joins another hydrocarbon molecule to it at the bond where the hydrogen atom was removed. In a commercial process, isobutane is united with butene to produce practically pure isooctane. A catalyst is employed and the operation is carried out at a relatively low temperature and pressure.

A recent catalytic alkylation plant uses as charging stock residual butane-butene fractions from hot-acid polymerization. Isobutane is recovered from the overhead fractions originating at the crude units. The olefin stream joins the isobutane stream and is blended prior to charg-

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instalación usa pirofosfato de cobre como catalizador. Se dice que se produce gasolina de número octano 84, que tiene un valor de mezcla de 95, y que se recupera como 95 por ciento a 400° F. Se llega a una conversión de 80 a 85 por ciento.

La alimentación es una fracción superior de un estabilizador que funciona con gasolina desintegrada y que contiene una cantidad mínima de pentano. La alimentación recibe lavado cáustico y se carga en reactores a 900 libras de presión y 410° F. Como la reacción de la polimerización es exotérmica, la temperatura se gobierna a un grado constante, por medio del reciclamiento de los productos livianos separados en el despropanizador. El pelímero y otros productos se separan por adecuada fraccionación.

Hidrogenación catalítica

La hidrogenación, en los procedimientos comerciales, ahora en operación, se efectúa siempre por método catalítico. El procedimiento agrega hidrógeno a la molécula y puede ser o no destructivo a la molécula. En la fase destructiva, se practica la desintegración o separación de la cadena de hidrocarburos, seguida por la adición de hidrógeno en los puntos donde ha ocurrido la separación. En la fase no destructiva, los insaturados se cargan y el hidrógeno se junta a la molécula, de modo que hay poco o ningún cambio en la escala de ebullición. La hidrogenación no destructiva se efectúa generalmente a bajas temperaturas y bajas presiones, mientras que la de tipo destructivo se lleva a cabo a altas temperaturas y presiones.

La hidrogenación fué introducida por la Standard Oil Co. of New Jersey, hace varios años, pero debido a la inversión relativamente alta que exige y a los subidos gastos de explotación, el procedimiento no se ha hecho de uso general. Se emplea ahora para producir ciertas naftas especiales, que pueden venderse a precios conmesurados con su costo de producción. Es ahora de especial interes, a causa de que estas naftas son muy adecuadas, como material de mezcla de combustible de aviación. Una típica instalación de hidrogenación de nafta de aviación hará conversiones de 50 a 75 por ciento por paso, produciendo nafta hidrogenada de número octano 75 a 78, de buenas características de estabilidad, bajo contenido de azufre y gran susceptibilidad al plomo.

El procedimiento U.O.P. para isooctano se vale de la hidrogenación catalítica para hacer isooctano. La fracción de isooctene, producida por polimerización catalítica, tiene un número octano de como 83 y se hidrogena a isooctano de número octano 96.

El procedimiento de la Shell hidrogena el isooctene a isooctano usando un catalizador de niquel reducido. Se emplean temperaturas de 390° F. y presiones de como 60 libras.

Deshidrogenación catalítica

La deshidrogenación no destructiva se efectúa pero procedimiento catalítico y comprende la quitada del hidrógeno sin desintegración. Esto generalmente no efecta much la escala de ebullición.

Algunas instalaciones están usando la deshidrogenación no destructiva de tipo termal, para convertir butanos de gas natural en butenes y productos similares. Se usan temperaturas hasta de 1.150° F. y presiones hasta de 1.000 libras. El procedimiento, son embargo, no es selectivo.

Los métodos catalíticos son interesantes porque son selectivos. Un procedimiento, recientemente anunciado, obtiene 72 por ciento de isobutene de isobutano, alrededor de 1.100° F. El propano es deshidrogenado a temperaturas un tanto mayores. El catalizador es un óxido de aluminio especialmente preparado, que se activa por una variedad de materiales, incluyendo óxidos de hierro y zinc, óxido de cromo y niquel reducido.

Otro procedimiento efectúa la deshidrogenación usando un catalizador de óxido de aluminio y cromo, y se dice que rinde hasta 95 por ciento de isobuteno de isobutano. Se usan bajas presiones, como de 15 libras, y temperaturas hasta de 1.400° F. Los butenes se polimerizan a isooctano, el cual puede hidrogenarse cataliticamente a isooctano, usando el hidrógeno producido en la primera fase.

Alcalización catalítica

La alcalización es de extrema importancia al presente a causa de su utilización en la producción de combustibles de aviación de número octano 100. La alcalización, en efecto, depriva al hidrocarburos saturado, de un átomo de hidrógeno, luego añade a el otra molécula de hidrocarburo en el punto de donde quitó el átomo de hidrógeno. En un procedimiento comercial, el isobutano se une con el buteno para producir un isooctano casi puro. Se emplea un catalizador y la operación se lleva a cabo a temperaturas y presiones relativamente bajas.

Una reciente instalación de alcalización catalítica usa, como material de carga, fracciones residuales de butano-buteno de polimerización de ácido caliente. El isobutano se recupera de las fracciones superiores, que se originan en las instalaciones de refinería de crudos. La corriente de olefina se une a la corriente de isobutano y se mezclan ambas antes de la carga. La alimentación mezclada entra entonces en reactores donde se pone en contacto con el catalizador de ácido sulfúrico, bajo factores de temperatura y tiempo precisamente regulados. El alcalato se saca y se carga en una instalación de destilación de doble columna o torre, para su separación en las fracciones deseadas. El número octano promedio del alcalato exento de

ing. The mixed feed then enters the reactors where it is contacted with a sulfuric acid catalyst under definitely controlled temperatures and time factors. The alkylate is withdrawn and charged to a two-column distillation unit for separation into the desired fractions. The average octane number of the butane-free alkylate produced from isobutane and normal butenes is reported as 93.

Products of alkylation have an advantage compared with isooctanes prepared by polymerization and hydrogenation in that the vapor pressures are generally higher and more nearly meet the requirements of finished aviation fuels. By adding needed pentanes and butanes to the charge and recovering during stabilization, the necessary vapor pressure and volatility can be achieved without much subsequent blending. The alkylates are practically sulfur free, of low gum content and are highly responsive to lead. These various factors make the process of special interest in view of the anticipated demand for high-octane-number aviation fuels.

Other processes require aluminum chloride as a catalyst as well as sulfuric acid. Reports are made of destructive alkylation using aluminum chloride catalyst under mild temperature conditions. Selected feeds are required for the best results.

Thermal Alkylation

In the thermal alkylation of oil fractions, no catalyst is employed. The process causes ethylene to react with isobutane to produce a saturated highly branched chain 6-carbon atom compound known as neohexane.

Ethane is dehydrogenated at low pressure and high temperature and is absorbed in a part of the isobutane charge. The mixture is introduced at different points in the coil through which more isobutane is pumped. Pressures of 3,000 to 5,000 lb. per sq. in. and temperatures of 950° F. are used to bring about the reaction. The fractionated product is of high-octane number and when blended with heptanes and octanes produced as side reactions, and leaded, will make 100 Army octane number without the use of isooctane. The straight neohexane boils at 121.5° F. and has an octane number of 94.

Neither neohexane nor isooctane alone is suitable for use as aviation fuel due to its volatility.

Isooctane is low in volatility and has to be blended with other hydrocarbons and the inclusion of these lowers the octane number to such a point that considerable leading is required to reach 100-octane number. The volatility of neohexane is such that when blended with isooctane, a balanced fuel is reached having an octane number of close to 100. As neohexane has good lead susceptibility, octane numbers of well above 100 can be reached by relatively little leading.

Catalytic Isomerization

Isomerization reactions may be described as changing the internal structure of the molecule without changing the percentage composition of the elements. This is of value because generally the isomeric forms of a hydrocarbon are more reactive than the normal and the synthesis of more complex hydrocarbons is thereby aided. The formation of isobutano, producido de isobutano y butanos normales, se dice que es 93.

Los productos de la alcalización tienen una ventaja, en comparación con los isooctanos preparados por polimerización e hidrogenación, en que las presiones de vapor son generalmente más altas y responden mejor a los requisitos de los combustibles de aviación acabados. Agregando los necesarios pentanos y butanos a la carga y recuperando, durante la estabilización, se obtienen la necesaria presión de vapor y la volatilidad, sin mucha mezcla subsiguiente. Los alcalatos están casi exentos de azufre, tienen poco contenido de goma y responden muy bien al plomo.

Alcalización termal

En la alcalización termal, de fracciones de petróleo, no es emplea ningún catalizador. El procedimiento hace que el etileno reaccione con isobutano para producir un compuesto de 6 átomos de carbono saturado y grandemente ramificado, que se llama neohexano.

El etano se deshidrogena a baja presión y alta temperatura, y es absorbido en una parte de la carga de isobutano. La mezcla es introducida a diferentes puntos del serpentín, a través del cual se inyecta más isobutano. Se usan presiones de 3.000 a 5.000 libras por pulgada cuadrada, y temperaturas de 950° F. para efectuar la reacción. El producto fraccionado tiene un elevado número octano y cuando se mezcla con heptanos y octanos, producidos como reacciones suplementarias, y se le agrega plomo, forma un combustible de número octano 100 aprobado por la aviación militar, sin necesidad de usar isooctano. El neohexano puro tiene un punto de ebullición a 121,5° F. y un número octano de 94.

Ni el neohexano ni el isooctano solo es adecuado a a uso como combustible de aviación, debido a su volatilidad.

El isooctano tiene poca volatidad y tiene que mezclarse con otros hidrocarburos y la inclusión de estos reduce el número octano a un grado en que es necesario agregar una considerable cantidad de plomo para alcanzar el número octano 100. La volatilidad del neohexano es tal, que cuando se mezcla con isooctano, se obtiene un combustible equilibrado, que tiene un número octano próximo a 100. Como el neohexano tiene buena susceptibilidad al plomo, puede producir combustibles con número octano superior al 100, con poca adición de plomo.

Isomerización catalítica

Las reacciones de la isomerización pueden describirse como cambios en la estructura interior de la molécula, sin alterar el porcentaje de composición de los elementos. Esto es de valor, a causa de que las formas isomericas de un hidrocarburo son generalmente más reactivas que la normal, y por esta razón, la síntesis de los hidrocarburcs más complejos queda así ayudada. La formación de isoparafinas de parafinas normales, encontradas en los gases livianos y destilados, para adicional tratamiento por isomerización, se incluye ahora en la práctica corriente. Estos productos se usan en la alcalización. Usando cloruro de aluminio, como catalizador, y operando a una temperatura de más o menos 200° F. y presión de 200 libras por pulgada cuadrada, el buano N y el pentano N se convierten en isobutano e isopentano con un rendimiento de como 75 por ciento.

Ciclización

La ciclización o aromatización es un nuevo desarrollo para hacer gasolina de alto número octano, de esencia de destilación. El objeto aquí es convertir las parafinas de cadena recta, en benzol, tolueno y xileno. Estos hidrocarburos tienen número octano de cerca de 100 y son adecuados, como agentes de mezcla, para hacer combustibles de motores, a pesar de que al presente no se aceptan como combustibles de aeroplanos. Son útiles en la producción de dos importantes explosivos, la conocida dinamita TNT y el ácido pícrico.

Se dice que el metano puede ahora incluirse entre los gases susceptibles de conversión en combustible de motor, a pesar de que el procedimiento no se practica comercialmente en estos momentos. El procedimiento sigue un nuevo tipo de reacción química, llamada condensación oxidativa, en la cual dos moléculas de metano se combinan formando etano, el cual, a su turno, es convertido en gasolina.

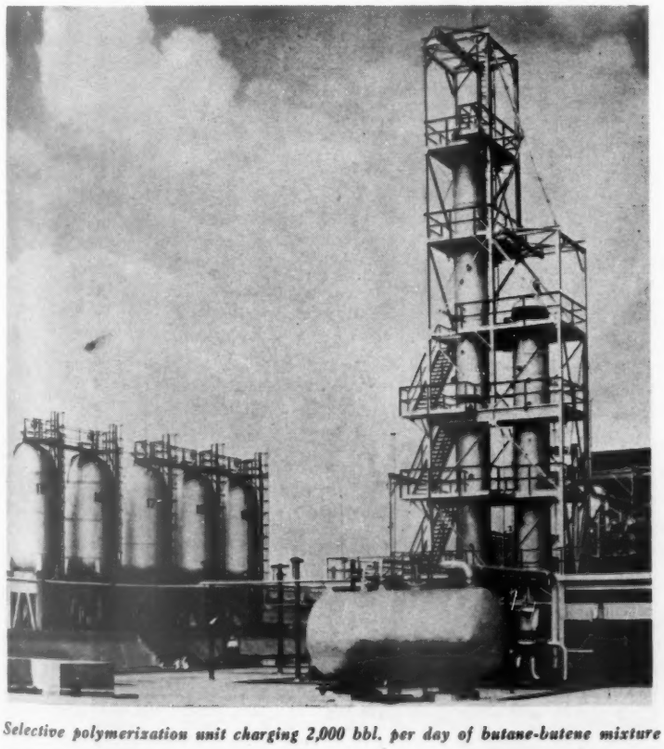
Instalaciones de combinación

Hasta hace poco, una buena parte de la construcción de refinerías de la industria se dedicó a instalaciones de combinación. Estas fueron para nuevos establecimientos o para renovación de antiguo equipo de destilación y desintegración o cracking. Su adaptabilidad y economía las hace muy convenientes para estos fines.

Al presente, la instalación de combinación parece que ha sido "olvidada" con la introducción de procedimientos más recientes, como son la desintegración catalítica, la reformación catalítica y otros que implican varios grupos para la sintetización de los hidrocarburos más volátiles. Probablemente, la demanda de combustibles de motor de mayor número octano es responsable de todo esto.

Fraccionación

Los nuevos procedimientos requieren equipo auxiliar proyectados para desempeñar funciones determinadas, y por esta razón, los adelantos se manifestan en toda la línea. En efecto, como la síntesis bajo condiciones cuidadosamente reguladas, reemplaza a la separación y conversión por medios físicos y mecánicos, de los hidrocarburos, los requisitos de funcionamiento más preciso con-



Selective polymerization unit charging 2,000 bbl. per day of butane-butene mixture

Instalación de polimerización selectiva, que usa una carga de 2000 barriles por día mezcla de butano-buteno

paraffins from normal paraffins found in light gases and distillates for further processing by isomerization is now practiced. These products are used in alkylation. Using aluminum chloride as a catalyst and operating at approximately 200° F. temperature and 200 lb. per sq. in. pressure, *n*-butane and *n*-pentane are converted to isobutane and isopentane with a yield value of around 75 per cent.

Cyclization

A process under development for making high-octane-number gasoline is cyclization or aromatization of straightrun gasolines. The object here is to convert straight chain paraffins into benzol, toluene, and xylene. These hydrocarbons have octane ratings of about 100 and are suitable as blending agents for motor fuels, although at this time they are not acceptable for use as airplane fuels. They are useful in the production of two high explosives, the well known TNT and picric acid.

The cyclization of paraffin hydrocarbons may be carried out by converting through catalytic means, normal hexane, heptane, and octane into benzol, toluene and xylene, respectively. Low pressures and fairly high temperatures are involved in the process.

It is reported that methane can now be listed as a gas subject to conversion to motor fuel, although the process is not now commercially practiced. The process follows a new type of chemical reaction called oxidative condensation, in which two methane molecules are made to combine, forming ethane, which is then converted into gasoline.

Combination Units

Until fairly recently, a substantial amount of refinery construction in the industry was devoted to combination units. These were either for new plants or were for replacing outmoded crude distillation and cracking equipment. Their flexibility and economy make them attractive for those purposes.

At the moment, the combination unit seems to be overshadowed by the newer processes such as catalytic cracking, catalytic reforming, and the various units for synthesizing the light hydrocarbons. Probably the urge for higher-octane numbers, and especially for aviation fuels, is responsible.

Fractionating

New processes require auxiliary equipment designed to perform specified duties and consequently improvements are being made all along the line. In fact, as synthesis under carefully controlled conditions replaces mechanical and physical separation and conversion of the hydrocarbons, the requirements for more precise operation grow. Temperature, pressure, and time must be controlled to closer limits and the need for better engineered auxiliary equipment is apparent. It goes without saying that the challenge is being met adequately.

Heaters are engineered for the load to be imposed. Design factors involve thermal efficiency, heat load, heat distribution, and time-temperature effect on the oil to be charged. Furnaces are designed for heating only with no decomposition of the oil; or for practically complete decomposition in the coil.

Combination unit heaters are generally multicoil affairs. Each broad portion requiring different temperatures for best results is handled in a separate coil. This applies particularly to the cracking section. Considerable design work, as well as metallurgical skill, were required in building the heater and coil for producing neohexane, for example, here pressures up to 5,000 lb. per sq. in. are reached. On the other hand, a good many of the catalytic processes for synthesis of the light hydrocarbons operate at low temperatures so that the heaters are small.

Fractionating towers either run to size, as in the case of a large combination unit, or to a many-plate construction where sharp separation is required. Some of the new selective polymerization or alkylation processes require feeds that have been narrowly fractionated. Such an operation might require several towers and these must be closely designed and equipped with a large number of plates in order to obtain the desired degree of fractionation.

Instrumentation

Probably no class of auxiliary equipment has had to meet such exacting demands as instrumentation. The modern complex systems, with their interrelating towers and furnaces, require a great many instruments in order to keep in balance. Various instruments, including recording pyrometers and potentiometers, temperature controllers, backpressure controllers, level indicators, and liquid-level controllers are generously used. Some of the newer units are equipped with as many as 70 instruments.

Pumps and Motors

Pumps find new and sometimes novel uses in the newer processes; as, for instance, the pumps required for pumping molten salt for cooling the catalyst cases in the Houdry process. Thermal polymerization and alkylation processes operating at high pressure impose new loads on the pumping equipment. The charging pump for the new neohexane unit, for example, is required to operate against a pressure of 5,000 lb. in the coil.

Of interest in the pump field is the recent development of explosion-resisting electric motors of large size. Explosionproof motors up to 400 hp. have been available for some time. Such motors are now in use driving gasoline pumps with ratings up to 1,000 hp. These motors use the

(Continued on Page 253)

tinuan en creciente demanda. La temperatura, la presión y el tiempo, necesitan muy cuidadosa regulación, y la necesidad de equipos auxilires de mejor proyecto y construcción, es evidente.

Los calentadores se construyen de acuerdo con la carga que se impondrá en ellos. Los factores de trazado comprenden rendimiento termal, carga de calor, distribución de calor y efecto de la duración de la temperatura sobre el petróleo por cargarse. Los hornos se proyectan para calentar solamente, sin descomposición del petróleo, o bien, para casi completa descomposición en el serpentín.

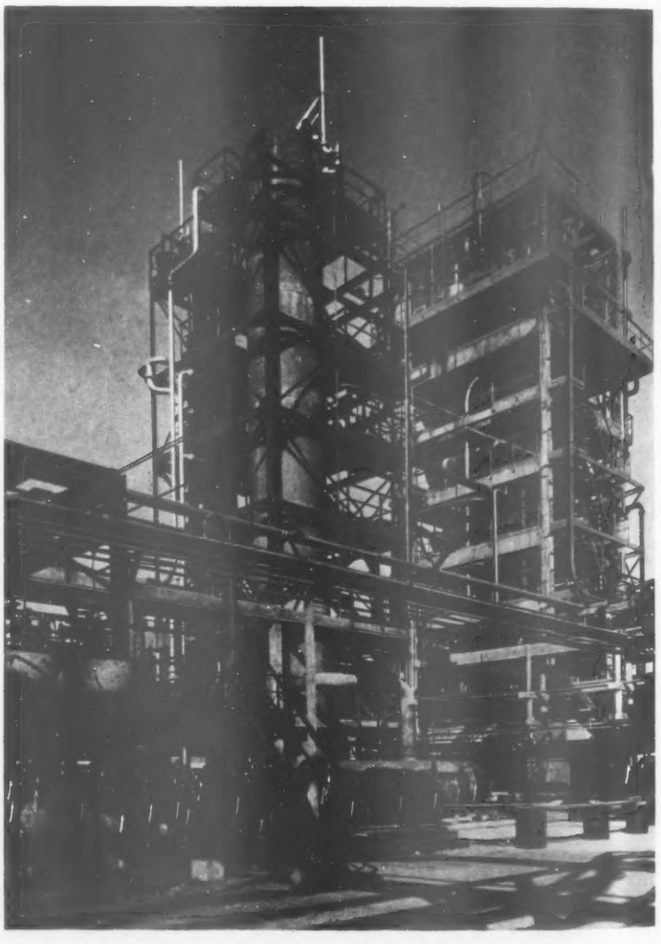
Las instalaciones de calentadores múltiples comprenden generalmente serpentines o alambiques múltiples. Cada fracción importante, que requiera diferentes temperatura, se maneja en serpentín separado, para mejores resultados. Esto se aplica particularmente a la sección de la desintegración o cracking. Se requirió gran pericia técnica y metalúrgica para la construcción de los calentadores y serpentines para la producción de neohexano, por ejemplo. Aquí se alcanzan presiones hasta de 5.000 libres por pulgada cuadrada. Por otra parte, un buen número de los procedimientos catalíticos para la síntesis de los hidrocarburos livianos funcionan a bajas temperaturas y los calentadores son entonces pequeños.

Las torres fraccionadoras se presentan en gran tamaño, como en el caso de las instalaciones de combinación, o bien en construcción de muchas placas, al tratarse de una separación muy exacta. Algunos de los nuevos procedimientos selectivos de polimerización o alcalización requieren alimentaciones que hayan sido muy bien fraccionadas. Semejante operación podrá necesitar varias torres y éstas tienen que estar muy bien proyectadas y construidas con un gran número de placas para obtener el deseado grado e fraccionación.

Instrumentos

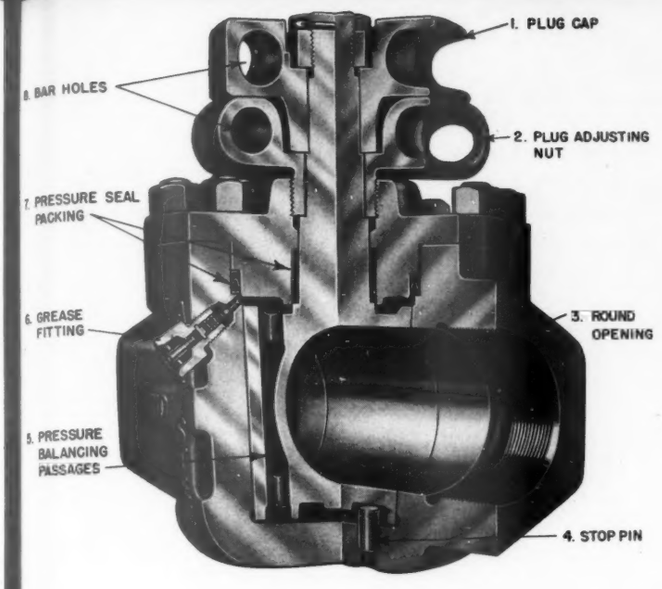
Probablemente ninguna otra clase de equipo auxiliar ha tenido que responder a demandas más exigentes que los instrumentos. Los modernos sistemas complejos, con sus torres y hornos intercomunicados, requieren una gran cantidad de instrumentos para conservar el trabajo bien equilibrado o compensado. Varios instrumentos, incluyendo pirómetros contadores y potenciómetros, reguladores de temperatura, reguladores de contrapresión, indicadores e nivel y reguladores de nivel de líquido, se usan ordinariamente en gran número, Algunas de las más recientes instalaciones tienen un

(Continue en Pagina 253)



Typical modern refinery distillation equipment

Tipico equipo de destilación de una refinería moderna

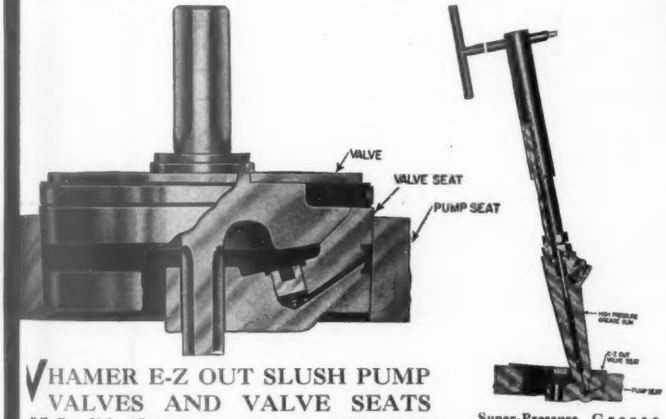


HAMER PLUG VALVES

Products of years of development work, field use, and manufacturing experience, Hamer Plug Valves are far superior in performance to conventional plug valves. They cannot stick because the bar-actuated adjusting nut under the plug head always lifts the plug to a free turning position; they always maintain a perfect shut-off because the precision-fitted plug can be pressed down to a tight fit in the body by means of the adjusting nut. Hamer Plug Valves for all oil field services are made with or without gearing, with full round openings, and in all-steel construction with chrome plated plugs to resist corrosion and prevent galling. Specify them.

VALVULAS DE OBTURACION HAMER

Porque son el resultado de años de estudio, aplicación práctica y experiencia fabril, las Hamer son muy superiores en funcionamiento a todas las válvulas de obturación de tipos corrientes. No pueden atascarse porque la tuerca de ajuste, actuada por barra, debajo de la cabeza del obturador, siempre levanta al obturador a una posición de vuelta libre. Siempre mantienen un cierre perfecto porque el obturador de ajuste de precisión puede apretarse muy bien en el cuerpo, por medio de la tuerca de ajuste. Las válvulas de obturación Hamer, para todo servicio de campo petrolífero, se hacen con engranaje o sin el, con aberturas completamente redondas, y en construcción toda de acero, con obturadores cromados para resistir la corrosión e evitar otros daños. Especifiquelas en su próxima compra.



HAMER E-Z OUT SLUSH PUMP VALVES AND VALVE SEATS

E-Z Out Valve Seats put an end to seat pulling problems. Valve seat is lifted out of pump by positive hydraulic pressure, exerted by Super-Pressure Grease Gun, in less time than is required to install conventional seat puller. Valve has new-type special rubber reversible insert with growth-resisting steel retainer ring which insures extra service. Proved in largest pumps on world's deepest wells.

Super-Pressure Grease Gun is screwed into connection in valve seat. Tremendous hydraulic pressure lifts valve seat. Cannot damage pump. One size grease gun fits all Hamer valve seats and pump pistons.

VALVULAS Y ASIENTOS DE VALVULAS HAMER E-Z OUT PARA BOMBAS DE LIQUIDOS LODOSOS

Los asientos de válvulas E-Z Out ponen fin a los problemas de quitar los asientos. El asiento de válvula es quitado de la bomba por presión hidráulica positiva, ejercida por pistola de grasa de super presión, en menos tiempo que el requerido para instalar un extractor de asiento de tipo ordinario. La válvula tiene una inserción reversible de caucho de nuevo tipo, con anillo de retención de acero, que asegura un servicio adicional. Ha demostrado su utilidad práctica en las bombas más grandes de los pozos más profundos del mundo.

La pistola de grasa de super presión se atornilla en la conexión en el asiento de la válvula. Una tremenda presión hidráulica levanta el asiento de la válvula. No daña a la bomba. Un tamaño de pistola de grasa se adapta a todos los asientos de válvula Hamer y embolos de bomba.

HAMER E-Z OFF SLUSH PUMP PISTONS

New design of metal body and rubber covering provides double set of pressure lips to insure effective seal and long operating life. Metal-to-metal contact with liner eliminated. In largest slush pumps on deep wells these pistons have given longer service and greatly reduced liner wear. Removed from rod by Super-Pressure Grease Gun without taking rods from pump.

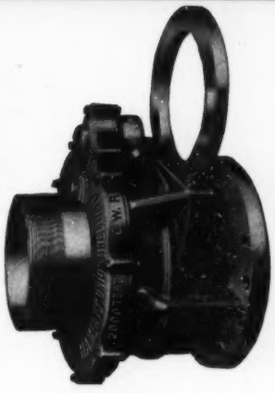
EMBOLOS HAMER E-Z OFF PARA DE LIQUIDOS LODOSOS

Un cuerpo metálico de nuevo tipo y una cubierta de caucho proveen un doble juego de labios de presión, para asegurar un cierre efectivo y una duración muy prolongada. No existe contacto metálico directo con el manguito o forro. En las más grandes bombas de líquidos lodosos de pozos profundos, estos émbolos han durado mucho más y reducido grandemente el desgaste de los forros o manguitos de los cilindros. Se quitan de la biela con la ayuda de la pistola de grasa de super presión, sin necesidad de sacar la biela o varilla de la bomba.

HAMER Products

HAMER LINE BLINDS

A *positive shut-off* can be made by one man in *less than one minute* on any pipe line, refinery manifold, or slush pump suction equipped with Hamer Line Blinds. Always full-open or completely closed; cannot fail to operate; unlimited service life. 2000-pound-test model illustrated at right; also made in economical 500-pound test models.



OBTURADORES DE LINEA HAMER

Un hombre solo puede hacer un cierre positivo en *menos de un minuto* en cualquiera linea de tubería, conductos de refinería o tubo de aspiración de bomba de lodo, que estén equipados con los obturadores de linea Hamer. Siempre se abren del todo o se cierran completamente; no pueden dejar de funcionar. Servicio de duración ilimitada. A la derecha ilustramos el modelo ensayado a 2000 libras. Los ofrecemos también en modelos económicos, ensayados a 500 libras.

HAMER CHRISTMAS TREE PLUG VALVES

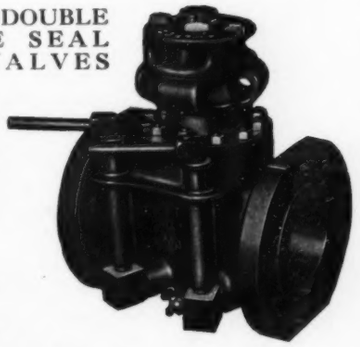
These Hamer plug valves are especially designed for use on christmas trees of high-pressure wells. Separate channels in the body around each opening are kept constantly full of special grease. This double grease seal, in combination with the precision fit of the chromium-plated plug, insures a positive shut-off. Made in 8000-Lb. and 6000-Lb. test models, geared or non-geared, with flanged or threaded connections.

VALVULAS DE OBTURACION HAMER PARA CHRISTMAS TREE

Estas válvulas de obturación Hamer están especialmente proyectadas para christmas trees de pozos de alta presión. La canalización separada en el cuerpo, alrededor de cada abertura, se mantiene, constantemente llena de grasa especial. Este doble cierre de grasa, en combinación con el obturador de precisión cromado, asegura un cierre positivo. Se ofrecen en modelos ensayados a 8000 y 6000 libras, con engranaje o sin engranaje, y con conexiones de reborde o roscadas.

HAMER DOUBLE GREASE SEAL PLUG VALVES

Developed for use on pipe lines carrying butane and other highly volatile liquids, and high pressure gases. Grease seal around each port is instantly renewed by turning screw-injectors on the large-capacity grease cylinders. Bleeder valve gives visual check of effectiveness of shut-off. Plugs chromium plated or clad with other metals, as desired. Valves geared or not geared.



VALVULAS DE OBTURACION HAMER CON DOBLE CIERRE DE GRASA

Perfeccionadas para uso en líneas de turbería de butano o de otros líquidos muy volátiles, o líneas de tubería de gases a alta presión. El cierre de grasa alrededor de cada orificio se renueva instantaneamente girando los inyectores de tornillo en los cilindros de grasa de gran capacidad. La válvula sangradora da verificación visual de la efectividad del cierre. Obturadores cromados o con revestimiento de otros metales, como se pidan. Válvulas con engranaje o sin engranaje.

Send for New 1941 Hamer Catalog or Refer to 1941 Composite Catalog
Pídanos ejemplar del nuevo catalogo Hamer de 1941 o refiérase al catalogo

HAMER OIL TOOL COMPANY
R. J. EIGHE

LEADING the FIELD

R. J. EICHE

THE CAVINS COMPANY
Automatic Hydraulic Suction Bailers —Screen Cleaners—Perforation Washers — Tubing Swabs — Perforation Swabs—Cement Dump Bailers.

CHIKSAN TOOL COMPANY
Ball Bearing Swing Joints—All Steel Rotary Hose—Cementing Hose—Mud Mixing Guns—Circulating Head—Dock Risers—Marine and Barge Hose.

CRUM-BRAINARD CO., LTD.
Roller Bits for all types of formations.

EASON-THEROLF TOOL CO.
All Steel Self-Cleaning Pump Valves —Insert Type Slush Pump Valves—Piston Rods—Catheads.

EASTMAN OIL WELL SURVEY CORP.
Well Surveying Instruments: Directional Single Shots and Drift Indicator. Directional Drilling Tools: Whipstock—Knuckle Joints—Bits and Reamers—Drill Pipe Orientation Equipment all types.

HAMER OIL TOOL CO.
Round Opening Pressure Balanced Plug Valves—Christmas Tree Flow Bean Plug Valve—Line Blinds—E-Z out Slush Pump Liner Sleeves.

HOPPER MACHINE WORKS, INC.
Portable Drilling Rigs—Well Servicing Hoists.

NON-CORROSIVE PRODUCTS LTD.
Protective Coatings—Pipe Line Wrapping Machines—Plastic Thread Fillers —Primers and Enamels.

SPECIALTY OIL TOOL CO.
Rotary Fishing Tools.

WEB WILSON OIL TOOLS
Rotary Tongs—Tong Fins and Dies—Elevators—Connectors.

★ **R. J. EICHE** ★
Foreign Sales Representative
MANHATTAN BEACH, CALIFORNIA, U.S.A.

HERE'S AN UNBEATABLE PAIR
for *any* valve job in the field!

E. & T. ALL-STEEL VALVES are *self-cleaning* and will stand up under all modern pump speeds and pressures. There are only *two* parts — the one-piece valve and the valve seat. Patented V groove and conical seat provide a *double fluid seat* against slippage and eliminate excessive pounding. Three wing guides steady the valve at all times. All steel construction prevents damage by oil or heat, enabling these Valves to handle mud, cement, acid, water or oil *at all temperatures!* Each Valve and Seat is individually ground and fit, then wired together to prevent separation until installed.

E. & T. SLUSH PUMP VALVES meet all requirements for handling the most abrasive mud fluid. Stem, body and wing guides are cast in *one* piece, heat-treated to extreme hardness and toughness, then ground to a precision fit. Cut-away type wing guides provide maximum volume area and eliminate swirling and cutting action of the fluid. High grade rubber inserts, easily installed, are of flexible lip construction to seal tightly against leakage. Valve seats are of drop forged steel, heat-treated and ground on both seating surface and surface that fits in the valve port.

E. & T. Valves are available for all sizes and makes of pumps. *Write for complete descriptive literature and prices!*

EASON & THEROLF TOOL COMPANY
P. O. BOX X, LOS NIETOS, CALIF.

CHIKSAN
All-Steel
ROTARY HOSE

Unlimited flexibility, assured by 17 swivels turning smoothly on double rows of hardened steel balls in flame-hardened races. All-steel construction does not deteriorate with age or climate. Light weight. Easy to handle. Safe. Costs less per foot of hole drilled.

4″ and 5″ Sizes for Drilling
3″ For Standby and Pressure Service
45′ - 50′ - 55′ - 60′ Lengths

BUY THE HOSE THAT FIT YOUR PUMPS

CHIKSAN TOOL COMPANY
BREA, CALIFORNIA

BALL BEARING SWING JOINTS for ALL PURPOSES
ALL-STEEL ROTARY HOSE
CIRCULATING HEADS • MUD GUNS
THREE-WAY DISC BIT
STANDARD AND HEAVY DUTY REAMERS

R. J. EICHE
EXPORT REPRESENTATIVE
50 Church St.,
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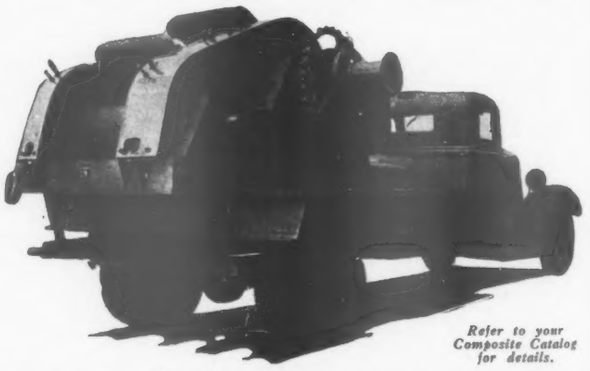
HOPPER HOISTS



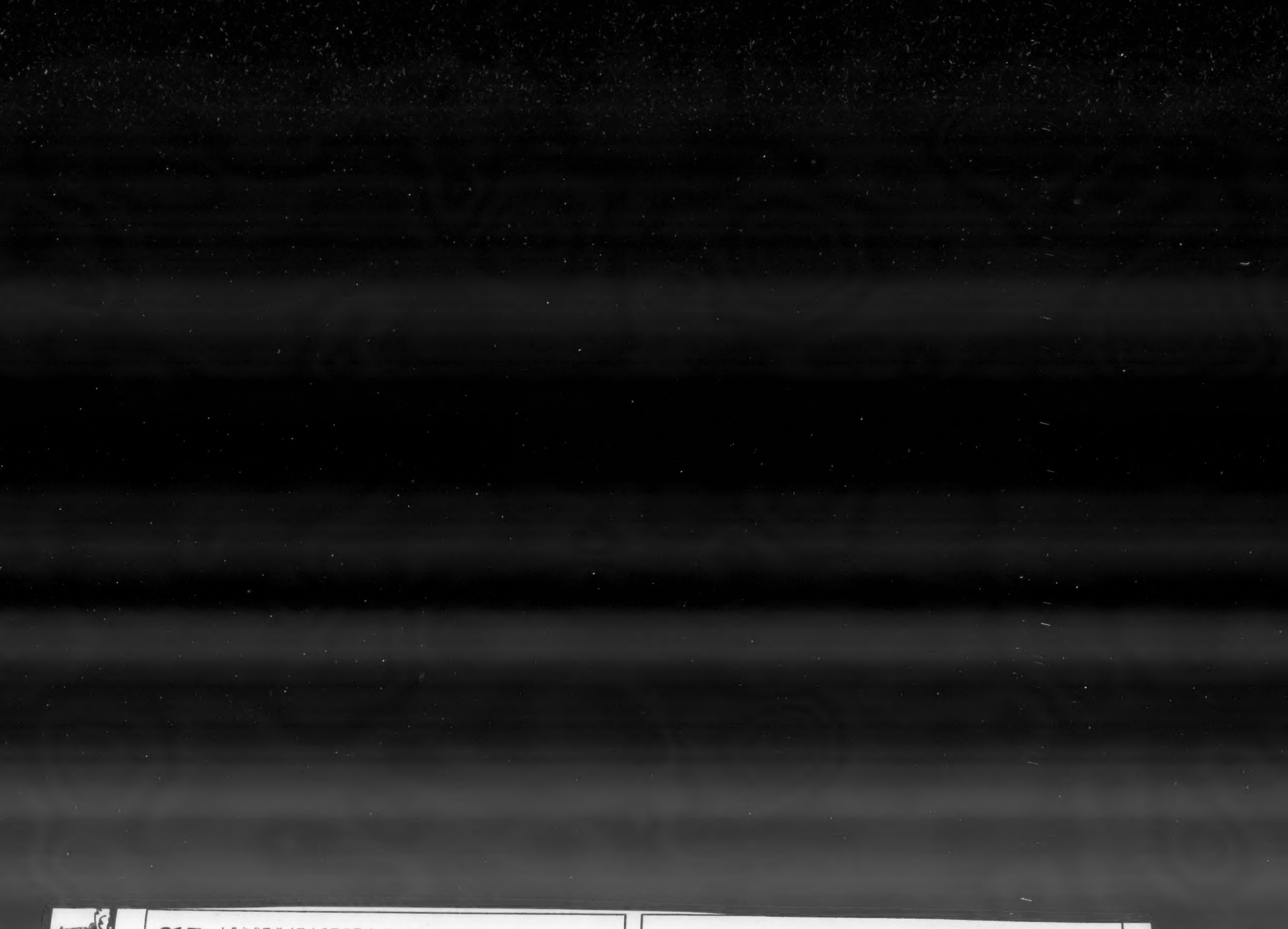
Refer to your Composite Catalog for details.

The line of portable hoists and draw-works manufactured by the Hopper Machine Works has behind it more than 25 years of experience in building this highly specialized type of oil field equipment. These units provide not only an efficient and economical method of servicing wells of any depth, but also may be readily used as a draw-works by applying a rotary attachment. This enables these machines to be used for rotary work such as bad fishing jobs, milling jobs, reconditioning, redrilling, perforating, removing oil liners and any other reconditioning or repair work requiring rotary equipment. When equipped for drilling, these units become efficient, easily operated draw-works. Their ready portability insures ease of transportation to any location.

Hopper Hoists are entirely self-contained, carry their own power, and may be backed up to the derrick floor and immediately put to work. All Units may be equipped with demountable telescoping masts, if desired.

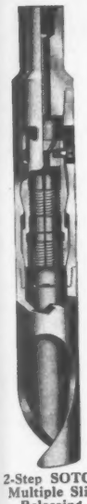
HOPPER MACHINE WORKS, INC.
BAKERSFIELD, CALIFORNIA, U.S.A.

R. J. EICHE
Foreign Sales Representative, Manhattan Beach, California, U. S. A.



FISHING AT ITS *BEST* with SOTCO "DEEP-ZONE"

Rotary Fishing Tools



2-Step SOTCO Multiple Slip Releasing Overshot

SOTCO offers the industry a complete line of specialized "deep zone" rotary fishing tools, serviceable at any depth and under every conceivable condition, especially designed to facilitate recoveries and reduce hazards. These tools are strong in construction, foolproof in design, and simple in operation. They are now being used in all the principal oil fields of the world, and wherever available for immediate use, serious fishing jobs are prevented and risks of stuck pipe and "washing over" jobs are eliminated.

The SOTCO catalog illustrating and describing the complete line of SOTCO fishing tools, will be mailed on request.

SOTCO MULTIPLE SLIP RIGHT HAND RELEASING OVERSHOT (SOCKET) 2-STEP and 3-STEP TYPES. These tools have been developed from the original SOTCO Single Step Releasing Socket, which is still manufactured. They provide more efficient, safer fishing, covering all present-day demands.

WASH-OVER HYDRAULIC WALL HOOK for washing over, cutting, inside shooting and shaking loose from the wall.

HYDRAULIC KNUCKLE (dog leg) for carrying any type fishing tool around a curve and out into a cavity.

PLAIN WALL HOOK: Has tool joint box for screwing into Hydraulic Knuckle. A tool which can be swung over to describe a large circle after pipe lost in "cave in"—slips do not take hold until pipe is in line with hole.

ADJUSTABLE GRAB for picking up any piece of metal, tool or equipment broken off or dropped in the hole, or stuck in the wall formation.

Hydraulic Giant Knuckle (Dog Leg)

SPECIALTY OIL TOOL COMPANY

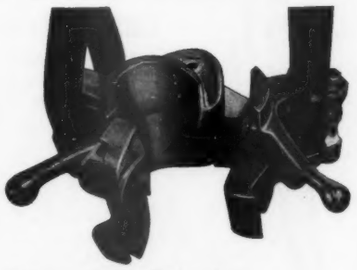
FACTORY: BREA, CALIFORNIA, U.S.A.

Cable Address: "SOTCO" ● Los Angeles

Highest Quality Drilling Tools

ELEVATORS

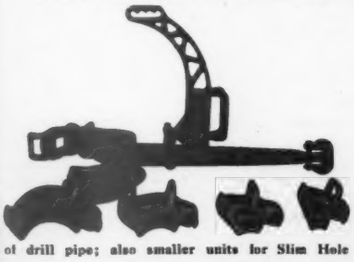
WEB WILSON Elevators are available in External Upset, Collar and Tubing types, and combine the EXTRA STRENGTH, EXTRA SAFETY and EXTRA SERVICE so necessary to quicker, safer, more economical drilling. Exclusive features include 240° pipe support on the body and a safety lever which prevents accidental door opening. Smaller WEB WILSON Elevators combining all the features of the units described above, are made for Slim Hole Drilling and Portable Rigs.



Write For Latest Descriptive Literature

TONGS, ELEVATORS, CONNECTORS, LINKS.

ROTARY TONGS



WEB WILSON Rotary Tongs are simple, powerful, firmly gripping tools which speed round trip time, make the work easier and greatly simplify the selection of proper parts in the derrick and warehouse. Will handle special collars, odd size or worn tools joints, drill collars or casing without buying extra parts. No alterations needed for regular, full hole or over-size joints. Manufactured in extra heavy and regular weights to fit all sizes of drill pipe; also smaller units for Slim Hole Drilling and Portable Rigs.

WEB WILSON *Oil Tools*

W. W. WILSON BUILDING, Huntington Park, California, U. S. A.

for EASIER, FASTER, BETTER, MORE ECONOMICAL *PERFORMANCE*

Use CAVINS

Performance-plus TOOLS

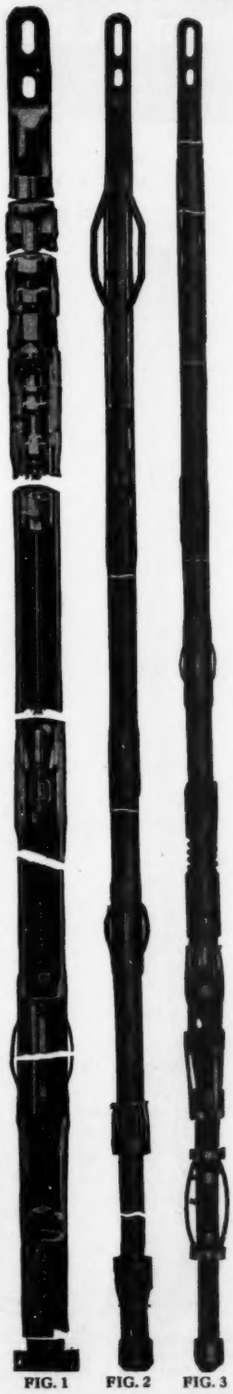


FIG. 1 FIG. 2 FIG. 3

Cavins *"Performance-Plus"* Tools save time, labor and unnecessary expense and do a better job faster and easier. They are made in a wide range of sizes for use on all sizes of pipe. Limited space prevents detailed information and specifications, which will be supplied promptly on request.

CAVINS AUTOMATIC HYDRAULIC SUCTION BAILER AND FISHING TOOL

Unsurpassed for fast, efficient breaking of hard packed sand bridges in casing and tubing; cleaning out below tight places in partially collapsed casing; cleaning out around and inside of stuck tubing, etc., prior to running a spear or socket; removing gravel tamp and shattered formation from shot wells; and for fishing out all types of movable junk. (See Fig. 1.)

CAVINS PERFORATION WASHER

A Cavins Bailer plus (1) equipment to open valve and take the load at any point desired by starting out of the hole, and (2) a shoe that concentrates the full force of the fluid weight outwardly against one clogged opening and back in through the next opening, thus positively opening the perforations. Operations can be directed exactly where desired . . . at the oil strata. Fluid then jets through the previously opened holes against the formation at each operation, to either wash it into the tool or let it settle to bottom of hole. Where a fluid head exists and production zone is known, this simple tool is the quickest way to increase production.

CAVINS SCREEN CLEANER

A special attachment used in combination with the Cavins Bailer that uses the hydrostatic pressure of the fluid column in the well to effectively open up and clean wire wrapped screen liners that are clogged with sand, mud, shale, etc. . . . practically a bailing operation. Opens the screen by fluid movement without removing screen from well, utilizing a hydraulic force far more effective than having the liner out of the well and connected to a high pressure pump; directing the force against the clogged openings outwardly a small section at a time.

Las herramientas Cavins *"Performance-Plus"* ahorran tiempo, trabajo y gastos innecesarios. Hacen mejor trabajo, con mayor rapidez y facilidad. Se hacen en una amplia escala de tamaños, para uso en tubo de cualquier diámetro. Por falta de espacio no podemos dar aquí información completa y características detalladas. A solicitud suministraremos todos los pormenores del caso.

ACHICADOR AUTOMATICO DE ASPIRACION HIDRAULICA Y HERRAMIENTA DE PESCAR CAVINS

No tiene rival para romper, con facilidad y rapidez, las acumulaciones de arena apretadas o duras en los revestimientos o tuberías, para limpiar debajo de puntos apretados en tubería parcialmente dislocada, para limpiar alrededor y en el interior de tubería atrapada, etc. antes de pasar un arpón de circulación o manguito de salvamento; para quitar la grava dura o la formación triturada de pozos dinamitados, y para pescar cualquiera pieza de hierro que pueda ser quitada. (Vea la figura 1.)

LAVADOR DE PERFORACION CAVINS

Con un achicador Cavins más (1) equipo para abrir la válvula admitir la carga en cualquier punto que se quiera, y (2) una zapata que concentra la fuerza completa del peso del líquido de afuera contra una abertura tapada y lo lanza luego contra la siguiente, para abrir positivamente los agujeros. Estes operaciones se hacen sólo donde se necesitan, en la capa o estrata de petróleo. El líquido se desparrama entonces por los agujeros o perforaciones previamente hechos, contra la formación, en cada operación y casi al fondo del pozo. Cuando existe una columna hidráulica y se conoce la zona productiva, esta sencilla herramienta es el método más seguro que se conoce para aumentar la producción.

LIMPIADOR DE COLADOR CAVINS

Un aditamiento especial, en combinación con el achicador Cavins, para hacer que el líquido en el pozo desaloje el lodo y arena que hayan tapado las aberturas, cosa que no es más que un trabajo de achicar. Hace que el mismo líquido del pozo abra el colador, sin necesidad de quitar el colador del pozo. Usa una fuerza más efectiva que sacar la tubería afuera del pozo, y conectarla a una bomba de alta presión; dirige la fuerza hidráulica contra las aberturas tapadas, hacia afuera, una pequeña sección cada vez.

Write for detailed descriptions and illustrations of Cavins *"Performance-Plus"* Tools, with actual performance data.

Pídanos descripción detallada e ilustraciones de las herramientas Cavins *"Performance-Plus"* incluyendo datos verídicos de funcionamiento.

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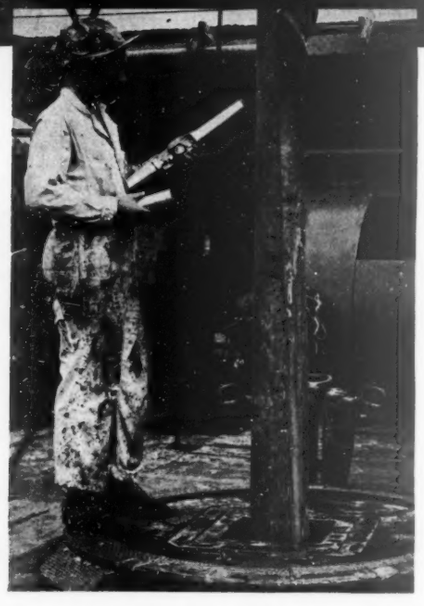
Originators OF CONTROLLED DIRECTIONAL DRILLING SERVICE • *Pioneers* OF OIL WELL SURVEYING



Eastman Removable Whipstock being lowered into the hole with sighting bar in place (Note Single Shot Survey Instrument in operator's hand).

Applications of Eastman Oil Well Surveys

1. Determine position of well on structure.
2. Aid in determining other well locations.
3. Derive actual inclination of dip observed in core laminations.
4. Assist in geological correlation and accurate contouring.
5. Determine true vertical depths of geological horizons.
6. Aid in study of well spacing on sand, interference and drainage.
7. Aid in determining why well missed production if in proven area.
8. Aid in study of recovery and yield per acre.
9. Aid in valuation of producing properties.
10. Aid in selection and location of in-put wells for repressuring or flooding operations.
11. Aid in solving production problems involving water encroachment, etc.
12. Aid in analyzing dynamometer results in weighing wells.
13. Aid in correcting temperature observation in thermal gradient studies.
14. Supply a record for future engineering and geological reference purposes.

Aplicaciones de los instrumentos de exploración Eastman

1. Determina la posición del pozo en la estructura.
2. Ayuda en la determinación de otras ubicaciones de pozos.
3. Deriva la verdadera inclinación del declive observado en laminaciones de núcleo.
4. Ayuda en la correlación geológica y correcta perfilación.
5. Determina las verdaderas profundidades verticales de horizontes geológicos.
6. Ayuda en el estudio del espaciamento del pozo en la arena, interferencia y drenaje.
7. Ayuda a averiguar por qué el pozo no produjo, aun estando en zona comprobada.
8. Ayuda en el estudio de recuperación y rendimiento por acre.
9. Ayuda en la avaluación de las propiedades productoras.
10. Ayuda en la selección y ubicación de pozos de entrada para las operaciones de represión o inundación o anegamiento.
11. Ayuda a resolver problemas de producción que comprenden presencia de agua, etc.
12. Ayuda en el análisis de resultados de dinamómetro, al pesar los pozos.
13. Ayuda en la corrección de observaciones de temperatura, en los estudios de gradiente termal.
14. Suministra un registro para futuras consultas técnicas y geológicas.

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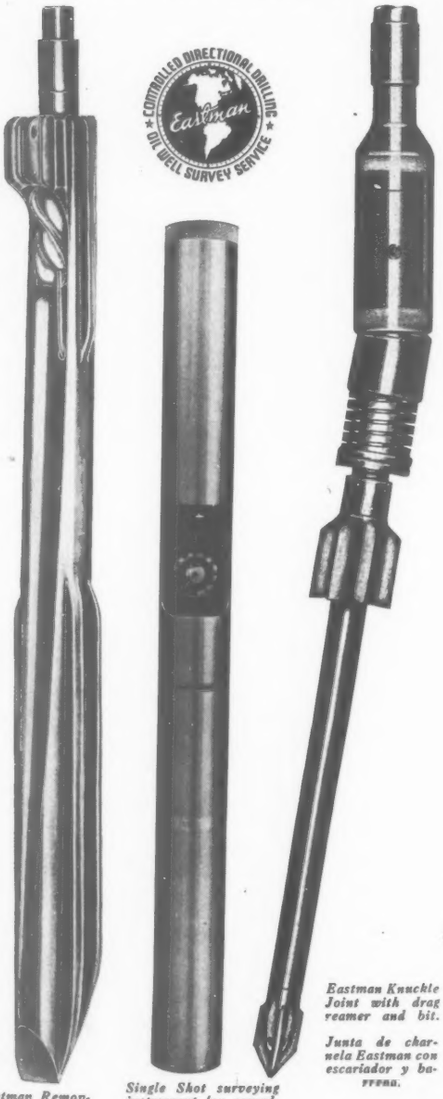


Eastman Removable Whipstock with drag bit.

Desviador amovible Eastman con barrena de arrastre.

Single Shot surveying instrument for recording photographically the drift angle and direction of a well.

Instrumento de exploración de indicación instantánea, para registrar fotograficamente el ángulo de inclinación y la dirección de un pozo.

Eastman Knuckle Joint with drag reamer and bit.

Junta de charnela Eastman con escariador y barrena.

Eastman Knuckle Joint on the drill pipe ready to be run into the hole.

Controlled Directional Drilling Applications

1. Deflecting wells to subsurface locations inaccessible from the surface, and drilling several wells from a single island, pier, or barge.
2. Deflecting under salt overhangs and out of salt plugs.
3. Drilling relief wells to control cratered blowouts.
4. Deflecting edge wells back into pay zones, and for recompleting exhausted wells in a new subsurface location by controlled directional *redrilling.*
5. Drilling across faults.
6. Keeping holes within property lines.
7. Subsurface multi-hole geologic exploration.
8. Sidetracking hole from unrecoverable fish and straightening crooked hole.

Aplicaciones gobernadas de perforación direccional

1. Deflexión de pozos a ubicaciones subterráneas, inaccesibles desde la superficie, y perforación de varios pozos de un solo punto central, muelle o barca.
2. Deflexión debajo de salientes salinas o por arriba de tapones.
3. Perforación de pozos de desahogo para gobernar reventazones.
4. Deflexión de pozos cercanos a zonas de paga y recompletación de pozos agotados en una nueva ubicación subterráneas, mediante perforación direccional gobernada.
5. Perforación a través de irregularidades.
6. Mantener los agujeros dentro de los límites de la propiedad.
7. Exploración geológica de agujeros múltiples.
8. Perforación desviada de útil que no puede recobarse y enderezamiento del agujero torcido.

EASTMAN OIL WELL SURVEYS

DALLAS • LONG BEACH

EXPORT OFFICE LONG BEACH, CALIF., U. S. A.

(Continued from Page 248)

dual ventilated frame construction and require no auxiliary apparatus. It is stated that complete independence of gas, air, or water supply makes for greater simplicity and dependability.

Exchangers

Because of the corrosive conditions under which exchangers and condensers operate, a great deal of attention has been given to the proper selection of metals and alloys for purposes of combating these elements. Hard alkali and sea waters present problems as do sulfur and various corrosive materials carried by the products of distillation.

Various copper alloys are used in making tubes for condensers and heat exchangers with admiralty metal the most commonly used, followed by red brass and cupro nickels. Other alloys include tobin bronze, aluminum brass, aluminum bronze, and several proprietary alloys.

Red brass is said to be much less subject to dezincification and has therefore been found to be well suited to the alkaline spray-tower waters common in the Southwest.

Aluminum brass has been used in locations where sea water is used for cooling, and interest in this alloy is developing. Nickel alloys are in some cases favored for extreme conditions and emergency repairs.

Tests with phosphorized admiralty metal indicate that dezincification is prevented by the use of phosphorus and that other properties are not impaired. Such an alloy seems to be superior under sour vapor conditions or for service with brackish or salty water.

Valves, Fittings, and Tanks

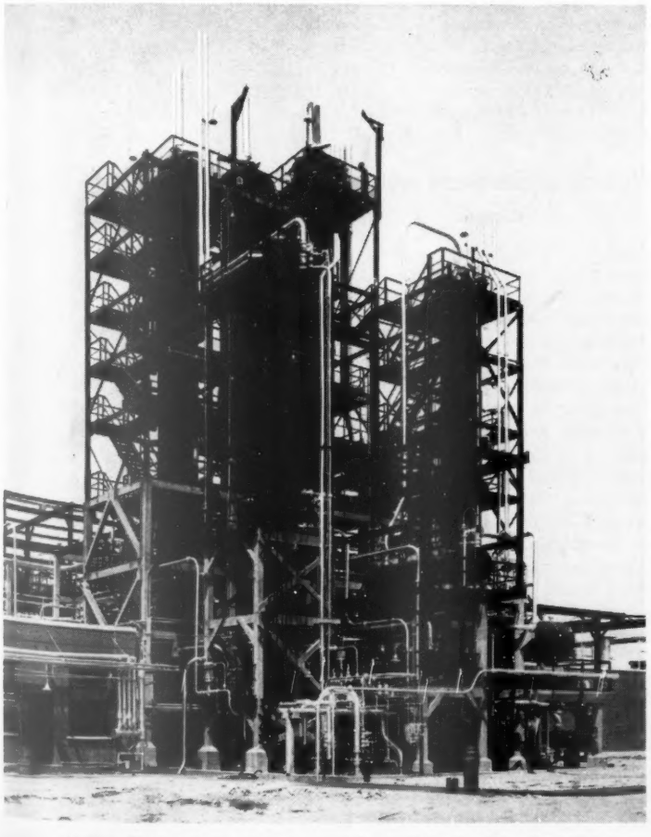
As pressures and temperatures increase, valve designs become more complicated. Sturdier valves are required and the factor of safety needs to be raised because of greater hazard. Corrosion becomes more of a problem and a concentrated study of metals is constantly going on to overcome the mounting difficulty.

The separation and storage of selected hydrocarbons for the various new processes usually mean tankage designed for high pressures, as these light fractions are generally high in vapor pressure. Spheres, spheroids and similar types are in greater demand. This type of tankage is also finding increased application for terminal storage of gasoline. Progress continues to be made in various devices for vapor saving.

Chemical Treating

The abrupt rise in the average octane number of house-brand gasolines within the past year has focused attention on gasoline treating. The base octane number is too valuable to lose in a poorly operated treating plant. Further, it is a well-established fact that sulfur, especially in certain forms, is very undesirable. Consequently, sulfur removal is of prime importance.

The type of sulfur compound in



Butane depropanizer added to catalytic polymerization plant

Despropanizador de butano agregado a instalación de polimerización catalítica

(Continue desde Pagina 248)

equipo que consta de 70 o más instrumentos.

Bombas y motores

Las bombas encuentran aplicaciones nuevas y a veces, novedosas, en los má recientes procedimientos. Por ejemplo, se requieren bombas para el manejo de la sal derretida que se emplea para el enfriamiento en las cámaras catalizadoras del procedimiento de Houdry. Los procedimientos de polimerización y alcalización, que funcionan bajo altas presiones, imponen nuevas cargas sobre el equipo de bombas. La bomba de carga que se usa en la nueva instalación de neohexano, por ejemplo, tiene que funcionar contra una presión de 5.000 libras en el serpentín.

De interes, en el campo de las bombas, es el reciente desarrollo de los motores eléctricos, de tipo de resistencia a explosión, de grandes capacidades. Los motores resistentes a explosión, hasta de 400 cdf., se han usado desde hace algún tiempo. Semejantes motores se usan para accionar bombas de gasolina, y tienen potencia hasta de 1.000 cdf. Estos grandes motores tienen bastidores de doble ventilación y no requieren aparatos auxiliares. Se dice que la completa independencia de abastecimiento de gas, aire o agua, los hace más sencillos y seguros en funcionamiento.

Cambiadores de calor

A causa de las condiciones corrosivas en que trabajan los cambiadores y condensadores, se ha dado gran atención a la correcta selección de metales y aleaciones, para combatir estos elementos. El alcali duro y las aguas de mar presentan problemas similares a los que ofrecen el azufre y varios materiales corrosivos que van con los productos de destilación.

Varias aleaciones de cobre se usan en la construcción de tubos para condensadores y cambiadores el calor, siendo el metal "admiralty" el más común de todos, seguido por el latón rojo y combinaciones de cobre y níquel. Otras aleaciones usadas son el bronce "tobin," el latón de aluminio, el bronce de aluminio y otras especiales patentadas.

Se dice que el latón rojo es mucho menos sujeto a dezinficación, y por esta razón, se ha encontrado bien adaptado a las aguas alcalinas de las torres de rocío tan comunes en el suroeste de este país.

El latón de aluminio se ha usado en lugares donde el agua de mar se emplea para los fines de enfriamiento, y está creciendo el interés en esta aleación. Las aleaciones de níquel se preferien, en algunos casos, para condiciones extremas y para reparaciones de emergencia.

Los ensayos con metal "admiralty" fosforizado indican que la dezinficación se evita por el uso de fósforo, y que no sufren, a causa de ésto, sus otras propiedades. Semejante aleación parece que es superior bajo condiciones de vapor ácido y para uso con agua salina.

Válvulas, conexiones y tanques

Con el aumento de las presiones y temperaturas, se complican más los modelos de válvulas. Se necesitan válvulas más firmes, y es menester, en vista del mayor riesgo, aumentar el factor de seguridad. La corrosión es un problema de creciente importancia y para sobreponerse a sus dificultades, se está dando profundo estudio a los metales.

La separación y el almacenaje de hidrocarburos seleccionados para los varios nuevos procedimientos significan, por lo general, tanques o depósitos especialmente proyectados y construídos para altas presiones, pues estas fracciones volátiles tienen ordinariamente alta presión de vapor. Las esferas, los esferoides y tipos similares, están en gran demanda. Este tipo de almacenaje está encontrando también creciente aplicación en el almacenaje de gasolina en los terminales.

Se continúa progresando en el sentido de perfeccionar los varios dispositivos ahorrativos de vapor.

Tratamiento quimico

El rápido aumento en número octano promedio de las gasolinas corrientes de marcas conocidas, durante el año pasado, ha focusado la atención en el tratamiento de este combustible. El número octano básico es cosa demasiado valiosa para desperdiciarse en una instalación de tratamiento malamente manejada. Por otra parte, es un hecho bien establecido que el azufre, particularmente en ciertas formas, es muy inconveniente. Por esta razón, la extracción del azufre revista importancia fundamental.

El tipo de la composición de azufre en la gasolina es tan importante como su cantidad. Los polisulfitos son muy inconvenientes, y a continuación vienen los bisulfitos, mercaptanos, tioéteres y tiofenos. Algunos de los otros procedimientos de tratamiento con plumbito convierten los mercaptanos en bisulfitos, y en algunos casos, se forman también polisulfitos. Como resultado, la gasolina tratada podrá tener menor número octano y ofrecer menos susceptibilidad al plomo que el material sin tratamiento.

Hay ahora varios métodos de llegar a buen resultado, tanto en el tratamiento por plumbito como en la extracción o depuración del azufre. Se están convirtiendo los antiguos métodos en los nuevos que emplean catalizadores. El tratamiento con plumbito, el lavado cáustico, el plumbito electrolítico, el procedimiento de sulfito de plomo, el tratamiento con cobre, el procedimiento Stratcold y la desulfuración catalítica, son algunos de los métodos seguidos actualmente.

Un nuevo método, el procedimiento Solutizer, efectua la desulfura-

the gasoline is as important as the quantity. Polysulfides are most undesirable, followed by disulfides and mercaptans, thioethers and thiophenes. Some of the other sweetening processes convert mercaptans to disulfides and in some cases polysulfides are formed as well. As a result, the sweet gasolines may be lower in octane number and have lower lead susceptibilities than the corresponding sour stocks.

There are many ways in use for reaching the goal of both sweetening and removing sulfur. Conversion of the old methods to new employing catalysts is being practiced. Doctor sweetening, caustic washing, electrolytic plumbate, the lead sulfide process, copper treating, the Stratcold process, and catalytic desulfurization are some of the processes now being employed for sweetening and sulfur removal.

A new method, the Sobulizer process, accomplishes sweetening of the gasoline by extracting completely the mercaptans, using a caustic solution of high solvency power. The solutizer consists of caustic soda to which 6 *n*-potassium hydroxide and 3 *n*-potassium isobutyrate have been added. Octane numbers are increased and lead requirements are reduced.

Continuous caustic washing substitutes actual removal of sulfur compounds for conversion to other forms. Residual sulfur compounds are then treated by a conventional doctor treatment following the caustic wash.

Mercaptan removal is reported at 60 to 65 per cent. Higher-octane numbers and better lead susceptibility are claimed.

Catalytic desulfurization solves the problem of greatly reducing the sulfur content of gasoline with a substantial gain in octane number and improvement in lead response. Sulfur compounds are decomposed and converted to hydrogen sulfide, which is withdrawn and burned in the fuel system. The catalyst used in one process is prepared from natural bauxite and is not regenerated, but is discarded, with yields of 4,000 to 5,000 bbl. treated per ton. The catalyst tower operates at 750° F. and 40 lb. pressure. Catalytic desulfurization is adaptable to the Houdry process also.

The copper treating processes are widely used, a large number of plants now being in operation. Gasolines so treated are sweetened without loss of octane number, and the lead appreciation is greatly increased

Diesel Fuels

In addition to the rapidly growing use of high-speed diesel engines in trucks, buses and railroad equipment, there is now the interesting possibility of their use being expanded to take in Army tanks and possibly airplanes. The furnishing of fuel requirements is of interest to the refiner for the specified values are not easy to meet. The problem of meeting minimum viscosity, maximum distillation point requirements, high cetane number, and low pour point, is a critical one.

Straightrun fuel distillates are generally used in the preparation of high-speed diesel fuels because the cetane number of thermally cracked distillates is too low. It is reported that the Houdry process is adaptable to producing satisfactory fuels in this class, since the catalytically cracked distillate has a cetane number of around 46. Catalytically cracked fractions from paraffin-base crude oils are only slightly lower than similar boiling range straightrun fractions and both yield equally to ignition accelerators.

Lubricants

The production of lubricating oils has seen little change in manufacturing technique during the past year, so far as the making of base oils is concerned. Some additions to solvent refining capacity have been made but no new solvents have appeared. The processes operate on well-established principles, although refinements are effected from time to time.

The trend in dewaxing is toward chemical means. Propane dewaxing, and processes employing benzol-acetone, benzol-ketone, and ethylene dichloride as solvents are in use. A recent installation uses methyl *n*-butyl ketone and methyl *n*-propyl ketone as dewaxing solvents with claims for excellent results. The mixture does away with the disadvantages of the methyl *n*-propyl ketone and the various advantages are utilized. Solvent losses are low and there is a good spread between dewaxing temperatures and pour point. It is reported that on certain stocks the pour point is as much as 16° F. below the filtering temperature.

Some further installations have been made of the Lummus emulsion process for deoiling wax. Here the wax is emulsified with water and centrifuged. By means of recycling, the oil content may be reduced to any desired point.

Actually, the greatest amount of attention in the lubricating-oil field has been directed toward the development of additive compounds for various purposes. Inhibitors against the development of acids and subsequent corrosion, compounds for adding detergency properties, and oxidation inhibitors are coming in for a great deal of attention.

The development of new engines almost always means new lubricating problems and a scramble among refiners to solve them. Prominence is now being given to the so-called high-capacity oils. These oils are generally highly refined, usually employing solvent extraction of selected crude stocks, and containing additives for purposes of detergency and inhibition of sludge formation. It is safe to say that if the present trend continues, most high-quality motor oils will be doped in some manner, with additives to give almost any predetermined effect.

ción de la gasolina extrayendo completamente los mercaptanos, para lo cual emplea solución cáustica de gran capacidad absorbente. El "Solutizer" consiste de soda cáustica, con adición de hidróxido de potasio 6 N e isobutirato de potasio 3 N. Se aumentan así los números de octano y se reducen, al mismo tiempo, los requisitos de plomo.

El contínuo lavado cáustico se usa como un substituto de la verdadera extracción de los compuestos de azufre, para la conversión a otras formas. Los compuestos residuales de azufre se tratan después, a continuación del lavado cáustico, de la manera corriente, por tratamiento a plumbito.

Se obtiene una extracción de mercaptano de 60 a 65 por ciento. Y se dice que el producto depurado ofrece alto número octano y mejor susceptibilidad al plomo.

La desulfuración catalítica resuelve el problema de reducir grandemente el contenido de azufre en la gasolina, con un considerable avance en número octano y mejoramiento en la respuesta al plomo. Los compuestos de azufre se descompen y convierten en sulfito de hidrógeno, el cual es extraido y quemado en el sistema de combustible. El catalizador usado en un procedimiento se prepara de bauxite natural y no se regenera, sino que se descarta. Rinde de 4.000 a 5.000 barriles tratados, por tonelada. La torre de catalización funciona a 750° F. y presión de 40 libras. La desulfuración catalítica se adapta también al procedimiento de Houdry.

Los procedimientos de tratamiento por cobre se usan mucho, habiendo numerosas instalaciones de esta clase en funcionamiento. Las gasolinas tratadas de esta manera se desulfuran sin pérdida de número octano y la susceptibilidad al plomo se aumenta mucho.

Combustibles para motores diésel

En adición al creciente uso de motores Diésel de alta velocidad en camiones, ómnibus y ferrocarriles, se presenta ahora la interesante posibilidad de que su aplicación se extienda también a tanques militares y hasta aeroplanos. El suministro de estos tipos de combustibles es de interes para el refinador a causa de que no es tan fácil satisfacer las características exigidas por los consumidores. El problema de resolver mínima viscosidad, máximo punto de destilación, alto número octano y bajo punto de congelación es muy serio, desde todo punto de vista.

Las esencias de destilación se usan generalmente en la preparación de combustibles para motores Diésel de alta velocidad, a causa de que el número cetano de los destilados desintegrados por procedimiento termal, es demasiado bajo. Se dice que el procedimiento Houdry se adapta a la producción de combustibles satisfactorios de esta clase, en vista de que el destilado desintegrado catalíticamente tiene un número cetano alrededor de 46. Las fracciones desintegradas catalíticamente de petróleos crudos a base de parafina son sólo levemente menores que las fracciones destiladas de similar escala de ebullición, y ambas se prestan igualmente a la acción de aceleradores de encendido.

Lubricantes

La producción de aceites lubricantes ha presenciado poco cambio en técnica manufacturera durante el año pasado, en lo concerniente a la producción de los aceites básicos. Se han hecho algunas adiciones a la capacidad refinadora de los disolventes, pero no se han introducido nuevos disolventes. Los procedimientos funcionan sobre principios bien establecidos, y de vez en cuando se ha introducido algunas innovaciones.

La tendencia en desparafinación es hacia medios químicos. La desparafinación con propano, y los procedimientos que emplean benzol y acetona, benzol y ketona, y bicloruro de etileno, como disolventes, tienen mucha aceptación. Una reciente instalación usa ketona, metilio y N-butilio, y ketona, metilio y N-propilio, como disolventes, en el procedimiento de desparafinación, con buenos resultado. La mezcla elimina las desventajas de la ketona, metilio y N-propilio, utilizando varias de sus ventajas al mismo tiempo. Las pérdidas de disolvente son bajas y hay una buena escala entre las temperaturas de desparafinación y el punto de congelación. Se dice que en ciertos materiales el punto de congelación queda a 16° F. debajo de la temperatura de filtración.

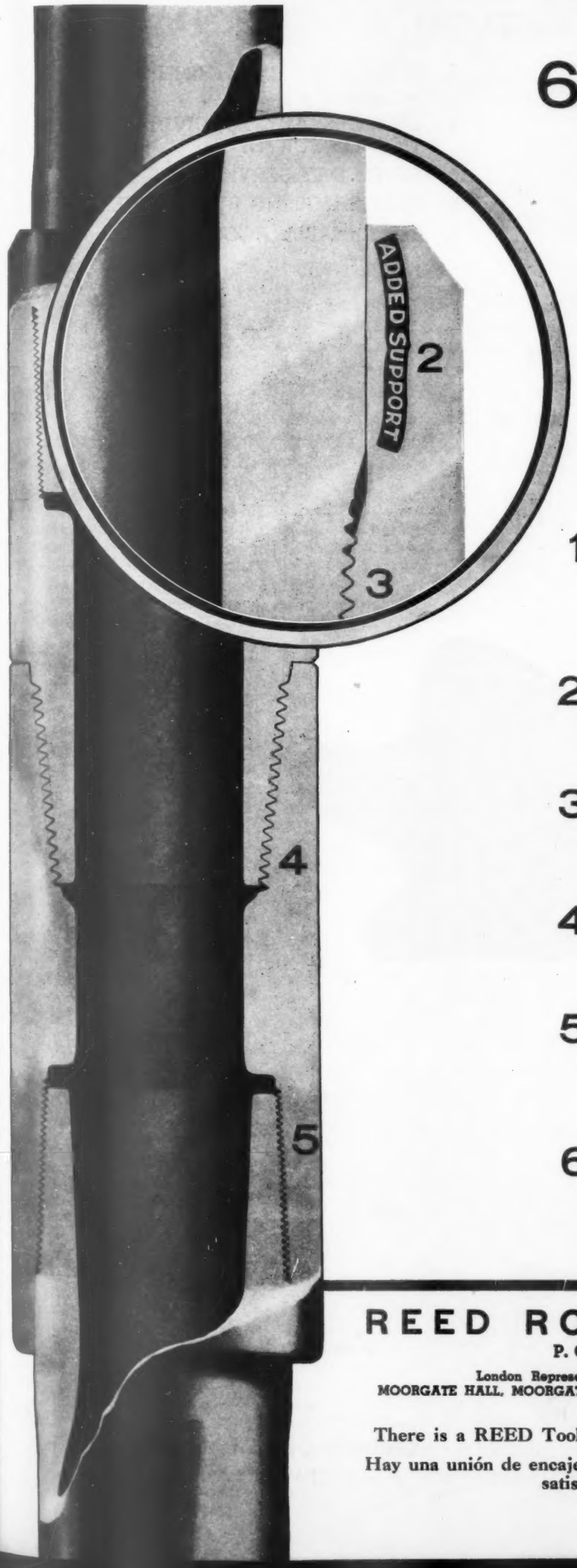
Se han hecho adicionales instalaciones del procedimiento de emulsión Lummus para deceitar la parafina. Aquí la parafina se emulsifica con agua y se somete a fuerza centrífuga. Por medio de una reciclación, el contenido de aceite puede reducirse a cualquier punto deseado.

Actualmente, la mayor atención, en el campo de los aceites lubricantes, se está dirigiendo hacia el desarrollo de compuestos de adición, para varios fines. Los inhibidores contra el desarrollo de ácidos y consiguiente corrosión, los compuestos para aumentar las propiedades de detergencia, y los inhibidores de oxidación, están recibiendo mucha atención.

El desarrollo de nuevos motores casi siempre significa nuevos problemas de lubricación y un esfuerzo inmediato, de parte de los fabricantes, para resolverlos. Se está ahora dando prominencia a lo que se llama aceites de alta capacidad. Estos aceites son generalmente muy refinados. Emplean, por lo general, materiales crudos elegidos, muy bien tratados, que contienen adiciones especiales para la detergencia e inhibición de formación de cieno. Podemos, con seguridad, decir, que de continuar la presente tendencia, casi todos los lubricantes de primera clase llevarán alguna substancia protectiva, además de adiciones especiales para producir casi cualquier efecto predeterminado.

MORE TOOL JOINT SERVICE PER DOLLAR

MAS SERVICIO DE UNION DE ESPIGA Y CAJA POR EL PRECIO PAGADO



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ELIMINATING COSTLY DELAYS AND EXPENSIVE SHIPPING COSTS.

RENOVABLES EN EL CAMPO—
ELIMINANDO COSTOSOS RETARDOS Y SUBSIDOS GASTOS DE EMBARQUE.

2 **THE REED SHRINK GRIP SAFETY AREA PREVENTS LAST ENGAGED THREAD FAILURES.**

LA ZONA DE SEGURIDAD DE LA GARRA DE ENCAJE EN CALIENTE REED IMPIDE LAS FALLAS DE LA ULTIMA ROSCA CONECTADA.

3 **PERFECT CONNECTION BETWEEN PIPE AND TOOL JOINT THROUGH ACCURATE HOBBING OF THREADS.**

CONEXION PERFECTO ENTRE EL TUBO Y LA UNION DE ESPIGA Y CAJA DE LA HERRAMIENTA MEDIANTE EXACTO LABRADO DE LAS ROSCAS.

4 **ACCURATE ALIGNMENT INHERENT IN SHRINK-GRIP PREVENTS UNDUE WEAR IN THESE THREADS.**

LA ALINEACION EXACTA INHERENTE DE LA GARRA DE ENCAJE EN CALIENTE IMPIDE EL INDEBIDO DESGASTE DE ESTAS ROSCAS.

5 **ACCURATE ALIGNMENT OF PIPE AND TOOL JOINT RELIEVES OUTSIDE WEAR AND PIPE FATIGUE . . . REDUCES HAZARDS OF COSTLY FAILURES.**

LA ALINEACION EXACTA DEL TUBO Y LA UNION DE ESPIGA Y CAJA MODERA EL DESGASTE EXTERIOR Y DEBILITAMIENTO DEL TUBO . . . REDUCE LOS PELIGROS DE COSTOSAS FALLAS.

6 **UNIFORMITY AND INTERCHANGEABILITY ASSURED THROUGH CAREFULLY CONTROLLED GAUGING PRACTICES.**

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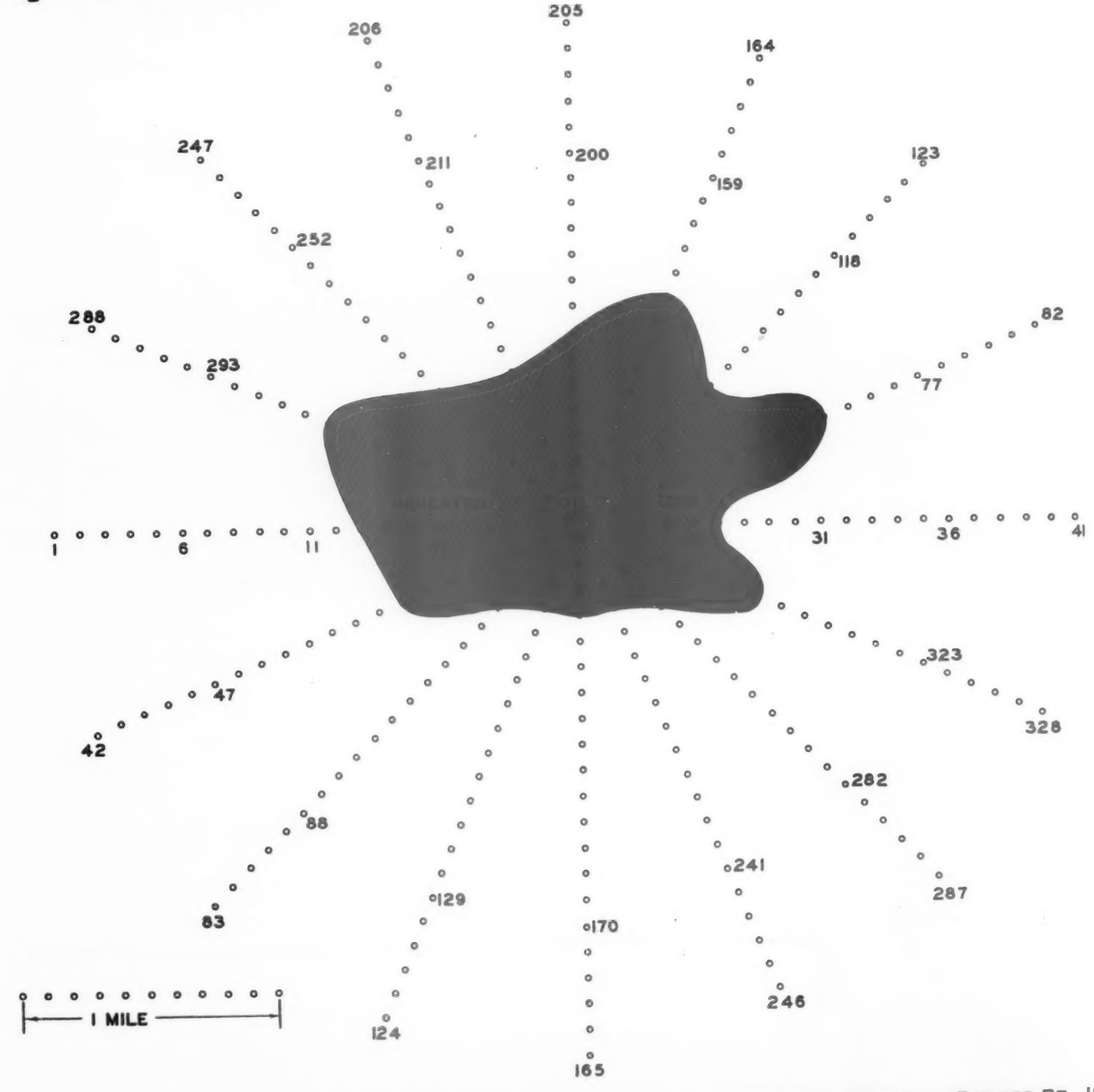

GEOLOGICAL SCIENTIFIC SERVICE CO., INC.
FIFTH FLOOR SINCLAIR BUILDING
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Dempsey - Wilson Construction Co. crew lining up 40-ft. joint for roll welding on the firing line at the southern section of the 162-mile line which is now being built for Natural Gas Pipeline Co. of America

Cuadrilla de la Dempsey-Wilson Construction Co. forrando una unión de 40 piés para su soldadura a la tubería conductora en la sección del sur de la línea de tubería de 162 millas que se está construyendo para la Natural Gas Pipeline Co. of America.

Pipe-Line Expansion

Extension de Lineas de Tuberia

IN addition to being a period of unusual pipe-line expansion, the past year has been notable for numerous improvements in methods for constructing and operating pipe-line facilities. In the United States, there has been a continuous enlargement of systems for transporting crude oil from new fields, particularly Illinois fields, as well as enlargement of transmission systems to provide for the increasing markets for natural gas. Of most significance for the future is the growth of lines for transporting gasoline and other refined products from refineries and marine terminals to points of distribution. At present the 8,000 miles of gasoline pipe lines in the United States represent only a small percentage of the lines laid for other purposes; it is less than 7 per cent of the crude-oil lines and less than 5 per cent of the natural-gas lines. These gasoline lines are probably just the beginning of a network which will extend ultimately throughout the country.

It should be mentioned that this year there has been more use of water transportation for moving crude oil and refined products from terminals of pipe-line systems by barges and tankers navigating rivers and lakes.

In discussing progress made in improving pipe-line methods a number of practices will be reviewed which enter into pipe-line work at the various stages between the making of the original survey for a new line and the maintenance necessary for keeping an old one in service. Before entering into this discussion mention should be made of two research projects which are of special interest to the industry this year.

One of these is the 10-year pipe-line-corrosion study which was concluded this summer by a group of organizations including American Petroleum Institute, Bureau of Standards, and pipe-line companies throughout the United States. The results of this study were presented to the annual meeting of the American Petroleum Institute in November.

The other research project referred to is sponsored by the American Society of Mechanical Engineers and experimental work is carried on at College of Engineering, University of Oklahoma, with the cooperation of the Bureau of Standards and other organizations for the study of displacement meters with special regard to their usefulness to crude-oil and gasoline pipe lines as well as other branches of the petroleum industry. This project was begun 2 years ago and the first reports on what has been done in several investigations were presented at the annual meeting of the Petroleum Division of the American Society of Mechanical Engineers in April.

Surveys

The advantages of aerial surveys in the work of locating pipe-line routes are becoming better appreciated. In mountainous country they are indispensable. Aerial surveys of ground in plains country covered with more than a foot of snow have been successfully made. It has been noticed that the topography of snow-covered terrain may be observed to better advantage than when vegetation is present. At one project where aerial surveying was done in February, all hubs and angle points were set and ties were made before the line was measured and the intermediate 100-ft. stakes were placed. Aerial maps were used for locating control points. Wherever practical, angle points were put on or near property lines. With the pipe line located in this way, it is easier for

(Continued on Page 261)

EN adición a ser un período de extraordinaria extensión de líneas de tubería, el año pasado ha sido también notable por numerosos refinamientos en los métodos de construcción y de operación de facilidades de línea de tubería. En los Estados Unidos de América ha habido una contínua expansión de los sistemas de transporte de petróleo crudo de los nuevos campos, particularmente los de Illinois, lo mismo que un ensanchamiento de los sistemas de transmisión, para responder a los crecientes mercados de gas natural. De mayor significación para el futuro es el progreso de las líneas para el transporte de gasolina y de otros productos refinados, de las destilerías o refinerías y muelles marítimos a los puntos de distribución. Al presente, las 8.000 millas de líneas de tubería en los Estados Unidos de América representan sólo un pequeño porcentaje de las líneas tendidas para otros fines; es menos de 7 por ciento de las líneas de petróleo crudo y menos de 5 por ciento de las líneas de tubería de gas natural. Estas líneas de tubería de gasolina son probablemente el comienzo de una red que finalmente se extenderá a todas partes del país.

Debemos también anota que este año se ha usado mucho más el transporte fluvial para el movimiento de petróleo crudo y productos refinados de los muelles de los sistemas de líneas de tubería, efectuándose los embarques en lanchones y buques tanques que navegan por ríos y lagos.

Al anotar el progreso que se ha alcanzado en el mejoramiento de los métodos de líneas de tubería, nos referiremos a un número de prácticas que entran en el trabajo de la línea de tubería, en sus varias etapas, entre el trazado original de la nueva línea y la conservación necesaria para mantener en servicio la línea antigua. Antes de entrar en discusión, será bueno hacer mención de dos proyectos de estudio, que son de particular interes para la industria este año.

Uno de ellos es el estudio de 10 años de la corrosión de línea de tubería, terminado este verano por un grupo de organizaciones, entre las cuales se incluyen el American Petroleum Institute, Bureau of Standards, y compañías de líneas de tubería de los Estados Unidos de América. Los resultados de este estudio fueron presentados a la reunión anual del American Petroleum Institute en noviembre.

El otro proyecto de estudio en referencia está auspiciado por la American Society of Mechanical Engineers, y los experimentos se están llevando a cabo en el Colegio de Ingeniería de la Universidad de Oklahoma, con la cooperación del Bureau of Standards y otras organizaciones, para el estudio de contadores de desplazamiento, con especial atención a su utilidad en líneas de tubería de petróleo crudo y gasolina, lo mismo que en otras ramificaciones de la industria del petróleo. Este proyecto se inició hace como 2 años y el primer informe sobre lo que se ha hecho ya en varias investigaciones, se presentó a la reunión anual de la división de petróleo de la American Society of Mechanical Engineers en abril.

Estudios

Las ventajas de los estudios aéreos, en el trabajo de trazar rutas para líneas de tubería, están recibiendo cada día, mayor apreciación. Son indispensables al tratarse de regiones montañosas. Los estudios aéreos de terrenos en lugares planos cubiertos con más de un pié de nieve se han realizado con éxito. Se ha visto que la topografía del terreno cubier-

(Continue en Pagina 261)

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FAULTLESS MOTOR OIL—100% paraffin base . . . second only to Diamond 760. Available in 1-quart, 5-quart and 5-gallon lithographed containers as well as in drums and barrels.

BRIGHT STOCKS—Mid-Continent bright stocks enjoy an enviable reputation for quality among jobbers and compounders at home and abroad. High flash and fire . . . low carbon . . . superior outer tone . . . viscosities from 100 at 210 to 200 at 210.

NEUTRAL OILS—An outstanding line of pale neutrals with unprecedented acceptance in both domestic and foreign markets. Viscosities as high as 600 at 100 . . . high flash . . . low pour . . . extremely low carbon residue . . . excellent color.

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PARAFFIN WAX—Unusually long fibre . . . excellent color and odor . . . recognized as the highest quality of semi-refined crude scale wax on the market.

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DESDE hace 25 años, los lubricantes de la Mid-Continent Petroleum Corporation han gozado de una envidiable reputación a causa de su invariable excelente calidad. Se conocen en todos los praises civilizados y actualmente la Mid-Continent figura entre las principales exportadoras de lubricantes de los Estados Unidos. La Mid-Continent disponde de facilidades completas para efectuar los envíos en tanques, tambores, barriles y en envases más pequeños, por el puerto de Nueva Orleans. Los embarques en grande escale se efectúan de otros puertos del Golfo.

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ACEITE DE MOTOR DIAMOND 760—El primero en el surtido Diamond de lubricantes vendidos bajo su marca de fábrica. Disolventes sometidos a procedimiento . . . es un producto de primer orden, en todo sentido. Gran resistencia al calor . . . bajo punto de congelación . . . base de parafina de 100%. Se suministra en envases litografiados de 1 cuarto, 5 cuartos de galón y de 5 galones, lo mismo que en tambores y barriles.

ACEITE DE MOTOR FAULTLESS—Base de parafina de 100% . . . solo es sobrepasado por el aceite Diamond 760. Se suministra en envases litografiados de 1 cuarto, de 5 cuartos de galón y de 5 galones, lo mismo que en tambores y barriles.

ACEITES CLAROS—Los aceites claros Mid-Continent gozan de merecida reputación por su superior calidad entre los comerciantes al por mayor del ramo y los mezcladores de lubricantes, en los mercados nacionales y en los del extranjero. Puntos de inflamación y de combustión elevados . . . leve contenido de carbón . . . Aspecto exterior excelente . . . con viscosidades de 100 a 210 hasta a 210.

ACEITES NEUTROS—Una serie notable de productos neutros pálidos, que tienen un precedente sin paralelo en aceptación en los mercados nationales y del extranjero. Viscosidades hasta de 600 a 100 . . . alto punto de inflamación . . . bajo punto de coagulación . . . residuo de carbón muy limitado . . . color excelente.

ACEITES EXTRAIDOS POR DISOLVENTES—Un surtido completo de aceites producidos por un procedimiento exclusivo de la propiedad de la Mid-Continent Petroleum Corp. Alto indice de viscosidad . . . baja volatilidad . . . color claro . . . aspecto exterior excelente . . . alto peso específico . . . resistente a la oxidación . . . muy limitado residuo de carbón.

PETROLEOS PARA MOTORES DIESEL—De clases y tipos de acuerdo con las caracteristicas y requisitos de todos los lubricantes de motores Diésel. El petróleo de motor Diésel D-X se produce especialmente para uso en motores "Caterpillar" y tiene la completa aprobación de la Caterpillar Tractor Co.

LUBRICANTES DE PRESION EXTREMA—Manufacturados con las mejores clases de aceites . . . durables, de correcta fluidez, resistentes a las altas temperaturas . . . adaptados a tobos los tipos de ejes traseros y cambios de marcha que requieren lubricantes de presión extrema.

LUBRICANTES DE ENGRANAJES HIPOIDALES—De muy fina calidad . . . para camiones y automóviles . . . fabricados según características muy exigentes, con aceites de bajo punto de congelación . . . pelicula de gran firmeza . . . no corrosivos.

ACEITES DE CILINDRO REFINADOS POR VAPOR—Altos puntos de inflamación y combustión . . . poco residuo de carbón . . . bajo punto de coagulación . . . excelente color verde . . . calidad excelente en todo sentido.

ACEITES NEGROS—ACEITES DE TRANSMISION—Alto punto de inflamación . . . limitado contenido de azufre . . . bajo punto de coagulación . . . de toda viscosidad, de 50 a 210 a 5000 a 210. La elección exclusiva de un gran número do fabricantes de automóviles, lo mismo que de comerciantes al por mayor del ramo y mezcladores de lubricantes, cuya preferencia se baca sobre los más exigentes ensayos y larga experiencia.

ACEITES INDUSTRIALES—Aceites de turbinas, dinamos, motores Diésel, cilindros de vapor, preparamos otros aceites o petróleos industriales de acuerdo con las caracteristicas que se nos indiquen.

CERA DE PARAFINA—Fibra de una longitud extraordinaria . . . color y olor excelentes . . . aceptada como la cera de petróleo bruto semi refinada más fina del mercado.

PETROLATO (CRUDO)—Punto de derretimiento de 135-160.

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(Continued from Page 257)

line walkers to patrol, since fence markers serve as guides for the location of angle points.

Pipe-Line Construction

What has been accomplished in construction this year demonstrates that, with skilled crews and modern equipment, contractors can lay pipe lines under difficult conditions. In spite of zero and subzero weather prevailing in Illinois in the winter months, important pipe-line construction work was carried on. During the year lines have been laid through desert country of the Southwest, through extensive swamps along the eastern Gulf Coast, and over mountains in the Northeast where grades were so steep and the ground so rough that it was necessary to pull equipment up these slopes by cable and tractor winches.

Pipe-Line Design

The design of a pipe line calls for the solution of hydraulic and mechanical problems which determine the size and type of pipe, the location of pumping stations, and the selection of pumping-station equipment.

The following table gives some of the data furnished by important projects undertaken in the United States and South America in the last 2 years:

PIPE SIZES

	Miles	Diam. (in.)	Weight (lb.)
Crude oil:			
Venezuela	100	16	62.579
			67.658
Illinois-Ohio	357	10	28
Utah and Wyoming	418	8	43.38
			28.55
			25.06
	24	6	17.60
Kansas	127	10	31.44
		8	28.55
Gasoline:			
Florida-Georgia	340	8	29
	110	6	19
Illinois	275	8	24.696

The laying of a 100-mile crude-oil pipe line in Venezuela last year with the unusually large diameter of 16-in. has not been followed by any major projects using pipe of this size.

There has been special interest this year in the experience of an organization during the first year of operating a long crude-oil pipe line which crosses mountains at high altitudes in the vicinity of the Continental Divide of North America where low temperatures occur in winter. Part of the oil handled is of high viscosity. The line is 442 miles long and it consists of 418 miles of 8-in. and 24 miles of 6-in. The line starts at an elevation of 4,224 ft. above sea level and rises 3,000 ft. within the first 50 miles to a plateau on the Continental Divide which it crosses for a distance of 325 miles, always at elevations above 6,000 ft. The line crosses two mountain ranges at 7,660 ft. and 7,440 ft. and descends 3,200 ft. before it enters a valley at practically the same elevation as the one at which it started.

Plans of the company called for the construction of a line to transport only 6,000 to 8,000 bbl. for requirements which were definitely in sight. Even though a 6-in. line might appear to be adequate for a project of this kind, it was decided to lay 8-in. pipe for the greater part of its length and only use 6-in. at the end of the line where there was sufficient head to insure satisfactory flow. By using 8-in. pipe it was possible to reduce with safety the number of stations.

The investment in additional pumping stations required for a 6-in. line would offset the difference between investment in an 8-in. and a 6-in. line. Furthermore, substantial savings could be made by operating the smaller number of stations required by an 8-in. line. In addition, the 8-in. line provided flexibility for meeting future requirements.

Four pumping stations were installed at intervals of approximately 100 miles. After the first month's operation, it was found that satisfactory deliveries could be made with one station shut down. Consequently, the line was operated through the winter with three stations separated by an interval of

Williams Brothers Corp. laying 200-mile line for Magnolia Pipe Line Co. by stovepipe method between Fort Worth, Tex., and Oklahoma City

La Williams Brothers Corp. tendiendo una linea de tubería de 200 millas para la Magnolia Pipe Line Co., siguiendo el método de tubo de estufa, entre Fort Worth, Texas, y Oklahoma City

(Continue desde Pagina 257)

to de nieve se presta a mejor observación que la del terreno cubierto de vegetación. En un proyecto en que el estudio aéreo se hizo en febrero, en pleno invierno, se establecieron todos los puntos del trazado antes de medirse la tubería y se colocaron las estacas de 100 piés intermediarias. Los mapas aéreos se usaron para fijar los puntos de gobierno o control. Cada vez que resultara práctico, los puntos de los ángulos se colocaron en las líneas o cerca de las líneas de la propiedad. Con la línea de tubería fijada en esta manera, resulta mucho más fácil la patrulla, de los inspectores, pues los indicadores de cerca sirven de guía para la posición de los ángulos.

Construcción de línea de tubería

Lo que se ha hecho en construcción este año demuestra que, con cuadrillas competentes y equipo moderno, los contratistas pueden tender líneas de tubería bajo difíciles condiciones. A pesar de un tiempo a cero y bajo cero, predominante en Illinois durante los meses de invierno, se ha llevado a cabo importante trabajo de construcción de línea de tubería. Durante el año, se tendieron líneas de tubería en terrenos desiertos en la región del suroeste del país, pasando por grandes pantanos a lo largo de la costa del este del Golfo, y pasando por montañas en la zona del noroeste, donde las pendientes eran tan empinadas y el terreno tan agreste, que se hizo necesario subir el equipo por estos declives, con la ayuda de cables y montacargas montados en tractores.

Tipo de línea de tubería

El tipo de línea de tubería exige la solución de problemas hidráulicos y mecánicos, que determinan el tamaño y modelo de tubo, la ubicación de estaciones de bombas y la selección del equipo de estación de bomba.

En la table siguiente damos algunos datos suministrados por importantes proyectos emprendidos en los Estados Unidos de América y la América del Sur estos últimos 2 años:

TAMANOS DE TUBOS

	Millas	Diametro en pulgs.	Peso en lbs.
Petroleo crudo:			
Venezuela	100	16	67,658
			62.579
Illinois-Ohio	357	10	28
Utah y Wyoming	418	8	43,38
			28,55
			25,06
	24	6	17,60
Kansas	127	10	31,44
Gasolina:			
Florida-Georgia	340	8	29
	110	6	19
Illinois	275	8	24,696

La instalación de una línea de tubería de 100 millas, para petróleo crudo, en Venezuela, el año pasado, usando tubos del extraordinariamente gran diámetro de 16 pulgadas, no ha sido seguida por ningún otro proyecto.

Ha habido especial interes este año en la experiencia de una organización durante su primer año de operación de una larga línea de tubería de petróleo crudo, que cruza montañas, a grandes alturas, en la vecindad del Continental Divide en la América del Norte, donde ocurren bajas temperaturas en el invierno. Parte del petróleo manejado es de alta viscosidad. La línea tiene 442 millas de largo y consta de 418 millas de tubería de 8 pulgadas y 24 millas de tubería de 6 pulgadas. La línea empieza a una altitud de 4.224 piés sobre el nivel del mar y se eleva 3.000 piés dentro de las primeras 50 millas a una meseta en el Continental Divide, cruzando este punto por una distancia de 325 millas, siempre a alturas de más de 6.000 piés. La línea cruza dos cadenas de montañas a 7.660 y 7.440 piés, y desciende de 3,200 piés antes de entrar a un valle, a una altura casi igual a la de su comienzo.

Los planes de la compañía incluyeron la construcción de una línea de tubería para transportar sólo de 6.000 a 8.000 barriles, para requisitos claramente determinados. Aun cuando una línea de tubería de 6 pulgadas parecía ser adecuada al presente proyecto, se decidió tender una de 8 pulgadas, por la mayor parte de la longitud, y usar una de 6 pulgadas al final de la línea, donde existe bastante inclinación para asegurar una corriente satisfactoria. Usando una tubería de 8 pulgadas, se hizo posible reducir con seguridad, varias estaciones intermedias.

La inversión en adicionales estaciones de bombas, requeridas para una línea de 6 pulgadas, compensó la diferencia en el costo de la tubería de 8 y d 6 pulgadas. Por otra parte, se lograron importantes economías operando el menor número de estaciones de bombas requeridas por la línea de 8 pulgadas. En adición, la línea de 8 pulgadas proveía flexibilidad o adaptación a satisfacer futuros requisitos.

Se instalaron cuatro estaciones de bombas, a intervalos de más o menos 100 millas. Después del primer mes de trabajo, se vió que se podía hacer una entrega satisfactoria suprimiendo una de las estaciones. Por consiguiente, la línea fué operada los meses de invierno, con tres estaciones, con un intervalo de 95,69 millas entre la primera y la segunda, y con uno de 205,68 millas entre la segunda y la tercera. La distancia entre esta última estación y el final de la línea es de 140,97 millas.

Esta reducción en el número de estaciones de bombas se hizo posible a causa de la baja viscosidad de la corriente mixta de petróleo crudo transportada por la línea.

Las viscosidades del petróleo transportado por la línea de tubería fueron:

	Viscosidad a 40° (S.S.U.)	Viscosidad y gravedad a 60° (S.S.U.)	(A.P.I.)
1.	300	88	36°
2.	550	69	43,4°
3.	606	100	26°

Las dos primeras clases se transportan todo el año. En los meses de verano, la clase tercera y más pesada se recibe en una de las estaciones auxiliares de una línea lateral. La viscosidad del petróleo crudo de segunda clase fué reducida mezclándola con 20 por ciento de crudo de baja viscosidad. De acuerdo con el

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★ Here's a line-up of Bowen Fishing Tools that are essential for overseas drilling operations. With these tools on your rig, you'll lick practically any fishing job that comes along . . . whether it's small junk lost in the hole . . . a twistoff . . . a stuck string of pipe or casing . . . or any other job that calls for fast work *and the right tools!*

And notice one thing about all these Bowen Tools—their *simple, rugged construction.* When you're far away from machine shops or other ordinary facilities it's mighty good to know you've got fishing tools that will stand on their own feet. There are no unnecessary parts in Bowen Tools to break down at the wrong time—*but they do have operating features all their own that make them efficient, fast and always dependable!*

Take time—now—to look these tools over carefully and see for yourself how they meet *your* standards for safety and fool-proof operation on the toughest jobs. *Then write Bowen for full details!*

★ Este surtido de herramientas de pesar Bowen es esencial para los trabajos de perforación en el extranjero. Con estas herramientas en su aparejo de perforación, podrá hacer casi cualquier trabajo de pescar que se presente—ya se trate de un pequeño útil perdido en el agujero . . . un retorcimiento . . . una tubería de producción o de revestimiento atascada . . . ya de cualquier otro trabajo que requiera rápida atención y las *correctas herramientas* para su inmediata ejecución.

Sírvase tomar nota de una cosa acerca de estas herramientas Bowen—su construcción *sencilla y firme.* Cuando uno está bien alejado de talleres de máquina o de otras facilidades ordinarias, resulta en gran alivio y seguridad el saber que se cuenta con herramientas de pescar que pueden hacer muy bien el trabajo. En las herramientas Bowen no hay piezas innecesarias, expuestas a romperse a cualquier momento. Todas estas herramientas tienen rasgos, exclusivos, que les imparte la *facultad de poder hacer el trabajo con rapidez, facilidad y seguridad.*

Le recomendamos que estudie ahora con detención estas excelentes herramientas, para que vea Vd. mismo cómo se adaptan idealmente a sus normas de seguridad, para hacer un trabajo eficaz y rápido, por defícil que sea. Sírvase escribir a la Bowen por información completa.

BOWEN CASING CUTTER

A precision tool for cutting casing, drill pipe or tubing. Ideal for "cut and pull" jobs. Simple to operate and won't slip down pipe after cutting begins. Withstands operating stresses at all depths. Can be set and released as often as desired *without coming out of hole.*

CORTATUBOS DE POZO BOWEN

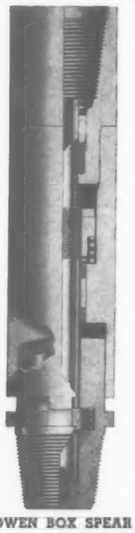
Una herramienta de precisión para cortar tubería de revestimiento, tubo de perforación o tubería de producción. Ideal para trabajos de cortar y quitar. Fácil de manejar. No se resbala por el tubo después de empezar a cortar. Soporta o resiste las tensiones del trabajo a cualquiera profundidad. Puede fijarse y soltarse las veces que se quiera, *sin que salga del agujero.*

BOWEN RELEASING OVERSHOT

Catches drill pipe, coupling or tool joint without changing slips or making adjustments. Spiral gripping member cinches tighter as load increases, yet releases with only a downward bump and a turn to the right. Built-in milling member trims ragged edges, insuring perfect gripping and packing off.

ENCHUFE DE DISPARO BOWEN (OVERSHOT)

Agarra el tubo de perforación, acoplamiento o unión de herramienta, sin cambiar manguitos o hacer ajustes. El miembro espiral de sujeción o agarro se pone más apretado a medida que aumenta el peso o carga, y se suelta con sólo un golpe hacia abajo y un giro a la derecha. Un miembro fresador, que forma parte integrante, suaviza los bordes ásperos, asegurando una sujeción perfecta y segura obturación.



BOWEN BOX SPEAR

The Box Spear catches either drill pipe box or coupling by merely changing slip members. It's used in left handing wherever hole diameter is too tight for outside fishing tools and tool joint box or coupling is up. Makes up with a positive grip that never lets go *until you want it to.* Available in a range of sizes with slips threaded for all types of drill pipe.

ARPON DE CJA BOWEN

El arpón de caja pesca la caja del tubo de perforación o el acoplamiento sencillamente cambiando los miembros del manguito. Resulta muy útil en agujero de diámetro demasiado apretado para herramientas exteriores de pesca o cuando la caja de la unión de espiga de herramienta o acoplamiento está arriba. Acciona con un agarro positivo que nunca se suelta, hasta que uno lo haga intencionalmente. Se ofrece en una amplia escala de tamaños con manguitos roscados, para todo tipo de tubo de perforación.

BOWEN JUNK BASKET

Made to retrieve every popular type bit cone as well as all small pieces of junk. Inner passages provide reverse circulation that enables *full pump pressure* to be used and permits circulating out of hole without losing fish. Also widely used for core recovery and hole straightening.

CANASTA BOWEN PARA UTILES

Sirve para atrapar cualquier tipo popular de cono de barrena, lo mismo que cualquier útil pequeño. Los conductos interiores proveen circulación invertida, que permite la utilización de la *completa presión de la bomba* para la circulación afuera del agujero, sin perder el útil pesado. Se usa también para la recuperación de núcleos y enderezar agujero.

BOWEN SAFETY JOINT

This Safety Joint is designed for all drilling and fishing operations. Has only two simple parts—a pin and box section—equipped with high pressure packers to prevent leakage. Safely stands greater pulling or twisting strains than the string, and releases only at the will of the operator. Will deliver full torque capacity of string in *either* direction.

UNION DE SEGURIDAD BOWEN

Esta unión de seguridad sirve para todo trabajo de perforación y de pesca. Tiene sólo dos piezas muy sencillas—un pasador y una sección de caja—equipada con obturadores o tapones de alta presión, para impedir el escape. Soporta con seguridad mayores tensiones de empuje y retorcimiento que la serie o columna y se suelta sólo a voluntad del operario. Suministra toda la capacidad del esfuerzo de rotación *en cualquiera* dirección.

BOWEN RELEASING SPEAR

Just six simple parts enable this tool to stand hardest use. Used for jarring, "cutting and pulling," left-handing, and holding casing while last joint is cut for landing. Holds with a positive grip, yet release can be effected whenever desired.

ARPON DE DISPARO BOWEN

Sólo seis piezas muy sencillas permiten a esta herramienta resistir el uso más duro. Se usa en trabajos de salvamento por percusión, "corte y tiro," sacar tubería mientras la última unión se está cortando para su colocación. Sujeta con un agarro positivo, y puede dispararse o soltarse cuando se quiera.

SPECIAL BOWEN ROTARY JAR

The choice of operators everywhere for all jarring. No torque required for delivering the blow—just a straight pull. As many as *ten blows per minute* have been struck. It incorporates means for varying pull required to trip it *without coming out of hole.*

PERCUSOR GIRATORIO BOWEN ESPECIAL

La elección de los petroleros en todas partes para el salvamento de piezas. No se requiere esfuerzo de rotación para la producción del golpe—sencillamente un tiro recto. Se puede dar hasta *diez golpes por minuto.* Comprende un medio para variar el esfuerzo o tiro que se requiere para su disparo, *sin sacarlo del agujero.*

BOWEN

Santa Fe Springs, California ★ Export: 30 Rockefeller Plaza, New York, N. Y.

95.69 miles between the first and second station and of 205.68 miles between the second and third stations. The distance from the last station to the end of the line is 140.97 miles.

This reduction in the number of pumping stations was possible because of the low viscosity of the composite stream of crude oil transported through the line.

Viscosities of the oil shipped through the line are as follows:

	Vis. 40° (S.S.U.)	Vis. and gr. 60° (S.S.U.)	(A.P.I.)
1	300	88	36°
2	550	69	43.4°
3	606	100	26°

The first two grades are pumped throughout the year. In summer months the third and heaviest grade is received at one of the relay stations from a lateral line. The viscosity of the second grade listed was reduced by mixing with 20 per cent of a low-viscosity crude. According to the original plan, these two crudes were to be mixed in exact proportions by connecting tanks to the pump by two separate suction lines. By this arrangement proportioning is accomplished by using one or more cylinders for each grade of crude. The two grades are discharged into a common discharge line where they are uniformly blended. But when this pipe line was first put in operation it was not possible to adopt this practice immediately because of a shortage of certain facilities. Consequently, as a temporary measure it was necessary to mix both crudes in one tank rather than in the line by means of the pump. It was found that when 40,000 to 50,000 bbl. of this mixed oil was stored in a 55,000-bbl. tank for 3 weeks or more in cold weather, the oil stratified into layers having different viscosities. As would be expected, the most viscous oil was at the bottom and it was necessary to exercise care to avoid letting this enter the line during winter months.

Since no pipe line had ever been operated at such high altitudes, there had been some speculation regarding the effect of prolonged periods of low temperatures. The experience of the first winter showed that the company was justified in burying the pipe not lower than the 20 to 24 in. which is conventional practice for all climates. The lowest temperature of the crude oil pumped through the line was 30° F., which was observed at the Continental Divide. This probably represents the average ground temperature around the pipe in that section. In a week when atmospheric temperature was between —4° and —13° F. the temperature of the oil moving through the line was lowered only 2° to 4°.

Hydraulic head at the first pumping station is 1,100 lb. During January and February pumping pressures at this station were 1,275 to 1,585 lb. for average daily pumpings of 2,021 to 3,578 bbl. During this same period the station operated at 315 to 625 lb. in pumping 5,810 to 6,233 bbl. The third station operated at 600 to 690 lb. in pumping 5,806 to 6,233 bbl. The operation of this line during the first year has exceeded expectations. There have been no failures in the lines or mechanical equipment. Service has been continuous and no oil has been lost.

Remote and Automatic Station Control

There has been a steady increase in the use of devices for operating small pumping stations by remote and automatic control where regular or continuous attendance may be eliminated. Two examples of this type of operation are given here:

At a crude-oil pipe-line station equipped with a high-speed gas engine driving a reciprocating pump, six control switches are wired in the battery circuit, in series with a magnetic valve in the gas fuel line. The six switches are (1) a mercury switch controlled by high-discharge line pressure; (2) a mercury switch controlled by low-discharge line pressure; (3) a mercury switch controlled by engine-lubricating-oil pressure; (4) a mercury switch controlled by engine-jacket-water temperature; (5) a time switch, and (6) a relay operated from another station via the simplex side of the telephone circuit.

If a drop in pressure is noted at any time, a unique method is used for checking pumping stations to ascertain whether pumping equipment is operating before a shutdown is ordered or the lines involved are inspected by line walkers. Checking is done by what is known as a "listening post." This consists of a double-contact relay operated by two voltages and different resistances. One contact opens a magnetic valve and it is operated by 125-volt direct current. The other contact is operated by a 55-volt current. This operation connects the high-frequency transmitter and the telephone circuit, which permits the operator at a distant station to listen by means of his telephone receiver to what is going on in the station; in this way he can tell whether the engine-driven pumping unit is running. If he hears the unit running, and if at the same time oil is not being received at the next station down stream, he can be sure there is a break either close to the receiving station or far enough from the pumping station to have no effect on the high-pressure relay. The operator can shut down the station until line repairs are completed. Shutting down is accomplished by throwing contact switch over to the high-voltage switch.

Another example of automatic operation of a different kind is to be observed at stations of a gasoline pipe line using straight-through operation. Although straight-through operation has the advantage of keeping evaporation losses to a minimum, it has the disadvantage of operating conditions with wide variations, since surge tanks are eliminated. To meet the requirements of flexibility, centrifugal pumps were installed.

plan original, estos dos crudos deberían mezclarse en proporciones exactas, conectando tanques a la bomba por medio de dos líneas de aspiración separadas. Mediante este arreglo, la proporción se realiza usando uno o más cilindros para cada clase de petróleo crudo. Las dos clases se descargan en una línea común de descarga, donde se mezclan bien. Pero, cuando este línea de tubería se puso por primera vez en operación, no fué posible adoptar esta práctica inmediatamente, debido a una insuficiencia de ciertas facilitades. Por esta razón, como medida provisional, se hizo necesario mezclar ambos crudos en un tanque, más bien que en la misma línea de tubería, con la ayuda de la bomba. Se vió que cuando 40.000 a 50.000 barriles de este petróleo mezclado se almacenaba en un tanque de 55.000 barriles, por 3 semanas o más, durante tiempo frío, el petróleo se separába en capas de diferentes viscosidades. Como era natural esperar, el petróleo más viscoso quedaba alfondo, y era necesario tomar much cuidado para evitar que entrara en la tubería durante los meses fríos del invierno.

Como ninguna línea de tubería se ha operado anteriormente a semejantes grandes altitudes, hubo, por lo tanto, cierta especulación acerca del efecto de prolongados períodos de bajas temperaturas. La experiencia durante el primer invierno mostró que la compañía tenía justificación en enterrar la tubería a no menos de 20 a 24 pulgadas, lo que es cosa o práctica corriente para todos los climas. La más baja temperatura del petróleo crudo pasado por la tubería fué como 30° F., observada en el Continental Divide. Esto probablemente representa la temperatura promedia del terreno alrrededor de la línea de tubería en esa sección. En una semana en que la temperatura atmosférica fué de 4 bajo cero a 13 bajo cero F., la temperatura del petróleo en movimiento por la línea de tubería bajo sólo de 2 a 4 grados F.

La columna hidráulica en la primera estación de bombas es de 1.100 lbs. Durante enero y febrero (meses de invierno) las presiones de las bombas de esta estación fueron de 1.275 a 1.585 libras para un promedio diario de 2.021 a 3.578 barriles. Durante este mismo período, la segunda estación funcionó a 315 a 625 libras, manejando de 5.810 a 6.233 barrilles. La tercera estación operó a 600 a 690 libras, manejando de 5.806 a 6.233 barriles. La operación de esta línea de tubería durante el primer año sobrepasó las esperanzas de sus dueños. No ha habido ninguna falla o irregularidades en las líneas o en el equipo mecánico. El servicio ha sido contínuo y no ha habido ninguna pérdida de petróleo.

Gobierno a distancia y automático de estación

Ha habido un continuo aumento en el uso de dispositivos para la operación de pequeñas estaciones de bombas, por gobierno a distancia y automático, donde puede eliminarse el cuidado personal contínuo o normal. Damos aquí dos ejemplos de este tipo de operación.

En una estación de línea de tubería de petróleo crudo, equipada con un motor de gas de alta velocidad, que da acción a una bomba de movimiento alternativo, hay seis interruptores de gobierno comprendidos en el circuito del acumulador, todos en serie con una válvula magnética en la línea del gas combustible. Los seis interruptores son (1) un interruptor de mercurio gobernado por presión de línea de gran descarga; (2) un interruptor de mercurio gobernado por presión de línea de baja descarga; (3) un interruptor de mercurio gobernado por la presión del aceite de lubricación del motor; (4) un interruptor de mercurio gobernado por la temperatura de la canalización de agua del motor; (5) un interruptor cronológico y (6) un relevador accionado desde otra estación, a trevés del lado simple del circuito telefónico.

Cuando se observa una caida de presión, en cualquier momento, se emplea un método muy efectivo para verificar las estaciones de las bombas, a fin de averiguar si el equipo está funcionando en debida forma, antest de ordenar una paralización o una inspección de las líneas afectadas. La verificación se hace mediante lo que se llama "puesto de escuchar." Esto consiste en un relevador de doble contacto accionado por dos voltajes y diferentes resistencias. Un contacto abre la válvula magnética y es accionado por corriente contínua de 125 voltios. El otro contacto es accionado por corriente de 55 voltios. Esta operación conecta el transmisor de alta frecuencia y el circuito del teléfono, lo cual permite al empleado en una estación distante escuchar por medio del receptor telefónico, lo que está pasando en la estación. De este modo, puede saber si el grupo de bomba accionado por motor está funcionando. Si escucha que el grupo de bomba está corriendo, y al mismo tiempo no se está recibiendo petróleo en la estación siguiente, podrá entonces sentirse seguro de que hay algún escape próximo a la estación receptora o bastante distante de la estación de bombas para no tener efecto sobre el relevador de alta presión.

Tuberías de bombas

Recientemente se ha dado considerable atención a la eliminación del oleaje en las líneas de tubería, y las molestias que causan. Las líneas de conexión de descarga han resultado eficaces. También se ha visto que es conveniente colocar las tuberías de la bomba en punto cercano a la estación. En las nuevas construcciones se ve una tendencia definida hacia apartarse del uso del foso de tubería cubierto por una caseta, cosa que ha sido la práctica corriente hasta ahora.

Gobierno de la presión de aspiración

Este año ha habido mejor apreciación de la significancia de las prác-

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Latest type Oliver Precoat Filter for continuous operation. Within the past few weeks three more of these units have been ordered by leading refineries, together with two dewaxing filters.

Filtration and clarification have always been essentials in refinery operations but with the industry becoming more and more chemical-conscious these will assume even greater importance. New methods and operations requiring filters new to the petroleum industry will find application. These must be specified by engineers thoroughly familiar with the many applications in industrial filtration.

It's a job for specialists—a job for those who have made filtration and clarification their one and only business, not merely an adjunct to some other line.

There can be only one answer—Oliver United. Why? Because we have been building filters continuously for over 30 years and have developed all methods for modern filtration in refineries and other industries, we have many filters from which to select and broadly-experienced engineers to help in the selecting.

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NUEVAS . . . . Substancias químicas . . . . Problemas de filtración

. . . TANTO MAS NECESIDAD DE ESPECIALISTAS EN FILTRACION

La filtración y la clarificación siempre han sido cosas esenciales en los trabajos de refinería, pero debido a que la industria depende ahora, más que nunca, de substancias químicas, estos trabajos asumirán cada día mayor importancia. Los nuevos métodos y operaciones requieren filtros igualmente nuevos en su aplicación a la industria del petróleo. Estos nuevos filtros deben especificarse por los ingenieros que están bien al corriente de sus muchas aplicaciones a la filtración industrial.

Es un trabajo para especialistas—un trabajo para aquellos que se han dedicado exclusivamente a la filtración y clarificación, y no a otros ramos congéneres.

Sólo existe una respuesta—Oliver United. ¿Por qué? Sencillamente porque desde hace más de 30 años no hemos dedicado continuamente a fabricar filtros, habiendo desarrollado todos los métodos para la moderna filtración en refinerías y otras industrias. Ofrecemos a su elección muchos filtros y dejamos a su disposición los servicios de nuestros ingenieros de vasta experiencia en el ramo, para que le ayudan a elegir lo que Vd. verdaderamente necesita.

OLIVER UNITED FILTERS INC.

Factories: Hazleton, Pa.—Oakland, Calif.
Manufacturing facilities in Australia, Canada, Japan and European Countries

Furthermore, it was necessary for pumping-station engineers to maintain continuous watch on inlet and outlet pressures.

Pump Manifold

Recently considerable attention has been given to eliminating surges in pipe lines and the trouble which they cause. Connecting discharge lines has been found to be effective. It has also been found to be desirable to place pump manifolds near the station. In new construction there has been a definite trend toward getting away from using the type of manifold pit covered by a house which has been conventional practice.

Suction Pressure Control

This year there has been greater appreciation of the significance of practices, which are connected with suction pressure control at trunk-line pumping stations. By the installation of a pressure-regulating valve between the receiving tank and incoming lines, it has been possible not only to increase capacity as the result of adequate filling of the pumps but it has been possible to increase the speed of the pumps with a consequent further increase in capacity. Controlled suction pressure also overcomes additional friction losses through heat exchangers installed between the receiving and suction lines. Control of the speed of the engines in order to synchronize the rate of pumping at stations on a line, makes it possible to operate so as to keep oil moving steadily through the pipe-line system without moving in and out of storage tanks, with attendant evaporation losses. This is done by means of a hydraulically operated governor which is regulated by suction pressure.

Vapor-Phase Cooling

Considerable interest has been manifested in the advantages of vapor-phase cooling of diesel engines. During the last half of this year three pipe-line stations in the widely separated states of Wyoming, Illinois, and Oklahoma, have been equipped for this type of high-temperature engine cooling. When this method becomes better established, it will probably be recognized as the most important step in internal-combustion-engine progress in many years. In simple terms it consists of supplying water to the engine jacket at or near the boiling point so that after the engine's heat is absorbed and the fluid emerges from the block, a slight decrease in pressure will cause the waste heat to be liberated in the form of steam. This steam is condensed in a radiator or heat exchanger and the condensate is pumped back into the system to complete the cycle. By forcing the fluid through the jacket at a rapid rate, hot spots are avoided and a more uniform temperature is maintained over the entire area of the cylinders. Furthermore, it has been observed that crankcase temperature has been lowered.

Meters

Displacement meters have been widely used by the pipe-line industry in the last 2 years. Some gasoline pipe lines are being designed and operated with provision made for all fluid measuring to be done by displacement meters. In studies carried on recently it has been concluded that the claimed standard of measurement, with a limit of error of 0.1 per cent, has been closer than is commercially practicable. The two types of displacement meters, the pack and film sealed, each has a particular field of application, depending on the accuracy of measurement required, permissible pressure drop, nature of register load and range of viscosity of fluids to be metered. In studying the economics governing the installation of displacement meters, consideration must be given not only to the cost of the meter but also to the additional cost of adequate liquid-conditioning equipment, calibrating devices and regularly scheduled maintenance.

Maintenance of Lines

Difficulties encountered in welding pipe which has been carrying sulfur-bearing crude have been overcome by a new procedure. In the past there has been considerable trouble with cracked welds when pipe of this kind has been welded in the usual way. This improved method requires feather-edge beveling, followed by heating and cleaning the pipe thoroughly for a distance of 6 in. from the end. The ends are then butted together for welding. For the first bead a 5/32-in. electrode is used with as little heat as possible. However, there are cases where it has been found necessary to use a ⅛-in. rod for the first bead if there is an unusual amount of sulfur in the pipe. Arc welding is used extensively by pipe-line companies in maintaining lines since it offers a quick, easy method of repairing pitted areas of pipe, applying half soles, and reconditioning leaky couplings.

A gang truck has been built by a pipe-line organization to be used in connection with construction and maintenance operations which incorporates several useful features. It is equipped with winch and gin pole which make it possible for the driver alone to make bends ahead of the welding crew. Work of this kind has been done at the rate of 1⅛ miles per day in rough country.

A pipe-threading device driven by the winch by means of a universal-joint attachment makes it possible for the driver and one helper to set up and finish a 6-in. thread in 3 minutes. A 4 by 5 pump driven from the winch sprocket is used to pump water from bell holes and pick up waste oil; a pressure gage mounted on the dash can be easily watched by the driver.

ticas relacionadas con el gobierno de la presión de aspiración en las estaciones de bombas de líneas de tubería principales. Mediante la instalación de una válvula reguladora de presión entre el tanque de recepción y las líneas de tubería, es posible no sólo aumentar la capacidad, como resultado de la adecuada llenada de las bombas, sino también es posible incrementar la velocidad de las bombas con un consiguiente aumento en capacidad. La presión de aspiración gobernada sirve también para reducir las adicionales pérdidas por rozamiento en los cambiadores de calor instalados entre las tuberías de recepción y aspiración. El gobierno de la velocidad de los motores, para sincronizar el régimen de marcha de las bombas de las estaciónes de una línea de tubería, hace posible una operación que facilita el movimiento contínuo del petróleo por el sistema de tubería, sin hacerlo entrar o salir de los tanques de almacenaje. Esto se hace por medio de un regulador accionado hidraulicamente, el cual está, a su turno, regulado por la presión de aspiración.

Enfriamiento de la fase de vapor

Considerable interest se ha manifestado en las ventajas del enfriamiento de la fase de vapor de los motores Diésel. Durante el segundo semestre del año, tres estaciones de línea de tubería en estados muy separados como Wyoming, Illinois y Oklahoma, han sido equipadas para este tipo de enfriamiento de motor de alta temperatura. Cuando este método quede mejor establecido, se aceptará probablemente como el paso más importante en el progreso del motor de explosión interna, de estos últimos años. En resúmen, consiste en suministrar agua a la canalización del motor en su punto de ebullición o cerca de este punto, de modo que después de absorbido el calor del motor y salido el líquido del bloque, una leve caida de presión haga que el calor de escape salga en la forma de vapor. Este vapor se condensa en un radiador o cambiador de calor, y el condensado se inyecta de nuevo en el sistema, para completar el ciclo. Inyectando el líquido por la canalización con gran rapidez, se evitan los puntos calientes y se mantiene una temperatura más uniforme en toda la superficie de los cilindros. Por otra parte, se ha observado que se reduce también la temperatura de la caja del cigüeñal.

Contadores

Los contadores de desplazamiento se han usado mucho en la industria de las líneas de tubería, durante estos últimos 2 años. Algunas líneas de tubería de gasolina han sido proyecyadas de modo que toda la medición del líquido se efectúa mediante contadores de desplazamiento. En estudios emprendidos últimamente, se ha visto que la norma de medición nominal, con un límite de error de 0,1 por ciento, ha sido más exacta que lo que se creía comercialmente praticable. Los dos tipos de contadores de desplazamiento, el de empaque y el de película cerrada, tienen sus respectivos campos de aplicación, dependiendo de la exactitud de la medición requerida, caida de presión permisible, caracter del registro de carga y escala de viscosidad de los líquidos por medirse. Al estudiar la conveniencia económica en conexión con la instalación de contadores de desplazamiento, ha de darse consideración no sólo al costo del contador, sino también al costo adicional del equipo de acondicionamiento de líquido, dispositivos de calibración y conservación basada sobre un programa bien organizado.

Conservación de las líneas de tubería

Las dificultades encontradas en la soldadura de tubería que ha estado transportando petróleo crudo con contenido de azúfre, se han subsanado mediante un nuevo procedimiento. En el pasado, se han presentado serios inconvenientes con soldaduras trizadas cuando la tubería de esta clase ha sido soldada de la manera corriente. Este perfeccionado método requiere biselar los bordes o extremos de los tubos, empleando, a continuación, calentamiento y limpieza cuidadosa del tubo por una distancia de 6 pulgadas del extremo. Los extremos se juntan entonces por soldadura. Para el primer reborde se usa un electrodo de 5/32 de pulgada, con la menor cantidad posible de calor. Sin embargo, hay casos en que se ha visto necesario usar una varilla de ⅛ de pulgada para le primer reborde, cuando hay presente una gran cantidad de azúfre en el tubo. La soldadura de arco se usa mucho por las compañías de líneas de tubería, para la conservación de las líneas, a causa de que este método ofrece rapidez y sencillez para la reparación de las partes picadas de la línea, aplicando medias zapatas o suelas y rehabilitando los acoplamientos con escapes.

Una organización dedicada a líneas de tubería ha construido un camión especial para trabajos de construcción y reparación de líneas, que comprende varios rasgos interesantes. Está equipado con un montacarga y poste, que permite al conductor hacer curvas y preparar el trabajo adelante de la cuadrilla de soldadores. El trabajo de esta clase se hace a razón de como 1½ milla por día en lugares escabroso.

Un dispositivo de roscar tubo, accionado por el montacarga, por medio de un aditamiento de articulación universal, permite al conductor, con un ayudante, preparar y acabar una rosca o filete de 6 pulgadas en 3 minutos. Una bomba de 4 por 5, accionada por la rueda dentada del montacarga, se usa para achicar agua de hoyos y recoger el petróleo desperdicado; un manómetro de presión, montado en el tablero, queda al frente de la vista del conductor.

THE GUIBERSON CORPORATION

Dallas, Texas, U. S. A.

Maracaibo — Export Office: 30 Rockefeller Plaza, New York, N. Y. — Trinidad

GUIBERSON SWABS

Patented

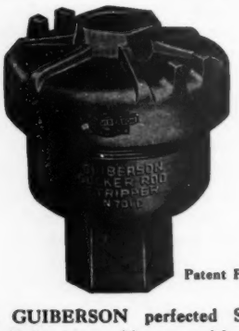
The GUIBERSON Swab is the only swab constructed on the correct principle, flexible cups yielding to by-pass fluid and obstructions running in, but being pressed tight against pipe by fluid pressure, coming out. Advantages: 1. Raises full loads; 2. Cups yield to pass projections and paraffin—will not stick; 3. Runs in faster; 4. Special composition cups protected by steel wires, wear longer; 5. Less wear on tubing and casing.

ESCOBILLONES GUIBERSON

Patentados

El escobillón GUIBERSON es el único escobillón construído según principio correcto, con las tazas o cubetas flexibles cediendo al líquido en derivación y a las obstrucciones entrantes, pero firmemente cerradas contra el tubo, por la presión del líquido saliente. Ventajas: Aumenta las cargas totales; 2. Las tazas ceden para dejar pasar partículas y la parafina; no se pueden atascar o trabar; 3. Se introduce más rápidamente; 4. Las tazas de composición especial y protegidas por alambres de acero, duran mucho más; 5. Menos desgaste sobre la tubería y el revestimiento.

SUCKER ROD STRIPPER



Patent Pending

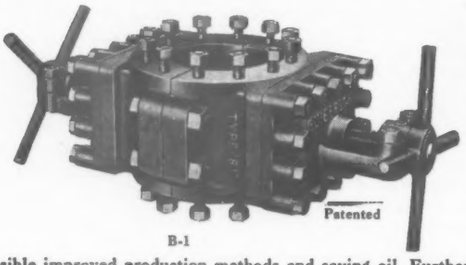
The GUIBERSON perfected Sucker Rod Stripper provides a positive seal against escape of oil and gas, when running in or pulling rods. Strips paraffin as well as oil from rods and couplings. Specially developed rubbers are long-lived. Two sizes of rubbers handle all sizes of rods.

DESGARRADOR DE VARILLAS DE ASPIRACION

Patente pendiente

El desgarrador de varillas de aspiración perfeccionado GUIBERSON asegura un cierre seguro contra el escape de petróleo y de gas, cuando se descienden o se levantan las varillas. Desgarra o quita toda la parafina y el petróleo de las varillas y de los acoplamientos. Las piezas de caucho de tipo perfeccionado son muy durables. Dos tamaños de piezas de caucho se adaptan a todos los tamaños de varilla de aspiración.

DRILL PIPE AND TUBING OIL SAVERS



B-1

Patented

GUIBERSON stands alone in having perfected a complete line of Oil-Saver equipment for high-pressure wells. There is no other equipment on the market comparable to these GUIBERSON High-Pressure Drill-Pipe and Tubing Oil Savers. These savers quickly pay for themselves through making possible improved production methods and saving oil. Furthermore, by making a positive seal around drill-pipe or tubing and eliminating any loss of oil, they (1) prevent fires by keeping oil from scattering; (2) Prevent oil-soaked, slippery derrick floors which cause injuries to men. Three types are offered: B-1 for pressures up to 400 pounds; C-2 for pressures up to 600 pounds; D for pressures up to 1,500 pounds. Heavy cast steel housing of the B-1 is in two pieces for easy assembly around the pipe. Housings of the C-2 and D are of alloy cast steel in one piece for extra strength. Special rubbers of a durable, oil resisting compound permit easy passage of pipe collars and are easily changed by removing end plates. Adapters to fit any type of hook-up are available.

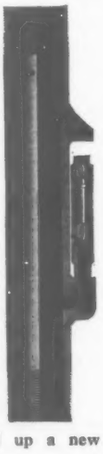
ECONOMIZADORES DE PETROLEO PARA TUBO DE PERFORACION Y TUBERIA

Patentados

GUIBERSON goza de la exclusiva distinción de haber perfeccionado un completo surtido de economizadores de petróleo para pozos sujetos a grandes presiones. Actualmente no hay en todo el mercado otro equipo que pueda compararse, en efectividad, con los economizadores de petróleo GUIBERSON para tubo de perforación y tubería bajo altas presiones. Estos economizadores pronto devuelven su propio precio, gracias al mejoramiento de los métodos de producción y ahorros en petróleo que establecen en la explotación. Por otra parte, al formar un cierre positivo alrededor del tubo de perforación o tubería, y al evitar toda pérdida de petróleo, producen los siguientes resultados: (1) evitan los incendios, pues el petróleo no puede desparramarse; (2) evitan que el piso de la torre se ponga aceitoso y resbaloso, con peligro para los operarios. Se ofrecen en tres tipos: B-1 para presiones hasta de 400 libras; C-2 para presiones hasta de 600 libras; D para presiones hasta de 1.500 libras. La gruesa tapa de acero fundido del modelo B-1 consta de dos piezas, para facilitar su instalación alrededor del tubo. Las tapas o cubiertas de los modelos C-2 y D son de aleación de acero fundida en una sola pieza, para adicional firmeza. Las piezas de caucho son de una especial composición muy durable y resistente al petróleo; permiten el fácil paso de los collares de tubería y pueden cambiarse con facilidad separando las placas laterales. Se ofrecen adaptadores para ajustarlos a cualquier tipo de conexión empleado.

NEW TYPE FLOW VALVE FOR GAS LIFT

Patent Pending



The New Type GUIBERSON Flow Valve at last provides the valve that gas-lift men have been awaiting. Its positive action is achieved by means of a double-action piston valve stem, the piston being effective at only one end at a time. Velocity of fluid has no effect of any kind on this valve. It opens only when the head of oil is heavy enough to overcome the pre-determined differential and it promptly closes after the gas has lifted and removed the head of oil, allowing the oil to build up a new head.

All guess work incident to the use of older types of gas or air lift valves is eliminated by the simplicity and positive functioning of the Guiberson New Type Valve. Each valve is tested on the factory's special test block and is guaranteed to perform successfully in the well for which it is recommended.

Complete recommendations will be gladly submitted by our engineers who are thoroughly experienced in gas lift problems.

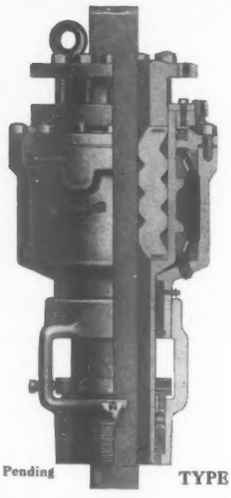
NUEVO TIPO DE VALVULA PARA INYECCION DE GAS

(Patente pendiente)

El nuevo tipo de válvula para gas GUIBERSON representa la válvula que los ingenieros de inyección de gas han ansiado desde hace tiempo. Su acción positiva se logra mediante un vástago de émbolo de doble movimiento, siendo el émbolo efectivo en un solo extremo cada vez. La velocidad del líquido no tiene ningun efecto sobre esta válvula. Funciona sólo cuando la columna de petróleo espesada hasta el punto de sobreponerse al diferencial predeterminado, y se cierra tan pronto como se ha producido le inyección del gas y quitado la columna de petróleo, permitiendo la formación de una nueva columna de petróleo.

Toda duda o especulación relacionada con el uso de válvulas de aire o de gas de tipo antiguo queda suprimida por la sencillez y efectivo funcionamiento de este nuevo tipo válvula Guiberson. Cada válvula se ensaya en la fábrica, en un aparato a propósito y se vende con la garantía de que funcionará perfectamente en el poz para el cual se recomiende.

Nuestros ingenieros someterán recomendaciones completas, basadas sobre su vasta experiencia en resolver problemas de este caracter.



Patent Pending — TYPE "E"

DRILLING HEADS

Guiberson Drilling Heads have consistently proven themselves in the field as ideal for drilling in wells under controlled pressure using either a square, hexagon or fluted kelly. Exceptional success has been achieved when running tubing under pressure. The positive leak-proof rotating pack-off between the kelly or drill pipe and casing is filling a long felt need. There are four Drilling Heads which operate the same in principle, as the packing medium rotates with the kelly and eliminates wear on the packing while drilling. The packing medium is designed so that it will pack-off around any standard kelly up to 4¼" and around any size tubing and drill pipe up to a maximum O.D. of 5¾".

The Type "H" is a combined Drilling Head and Rotary Table. In field use it has proven itself exceptionally qualified for well completion and clean-out work. The Type "H" Head differs from the "B", "F" and "G" because of a rotary table which includes slip bowl and kelly bushings as an integral part of the head. A drive shaft built into the "H" head can be connected to draw-works, electric motor or a gas engine. In this head the kelly bushing rotates the kelly. Power is derived from the drive shaft. Tested to 3,000 lbs.; recommended for working pressures up to 1,500 lbs.

CABEZAS DE PERFORACION

Las cabezas de perforación Guiberson han siempre resultado ideales para la perforación de pozos bajo presión gobernada, que usan un kelly rectangular, hexagonal o cilíndrico. Se ha tenido un éxito extraordinario con estas cabezas, al introducir tubería bajo presión. El obturador giratorio positivo, a prueba de escape, entre el kelly o tubo de perforación y tubería de revestimiento, está satisfaciendo una necesidad desde hace tiempo sentida. Hay cuatro cabezas de perforación, que funcionan sobre el mismo principio, mientras el medio de obturación gira con el kelly y suprime el desgaste de la empaquetadura durante la perforación. El elemento obturador está proyectado para actuar sobre cualquier kelly normal hasta de 4¼" y alrededor de cualquiera tubería o tubo de perforación hasta de 5¾" de diámetro exterior.

El tipo "H" es una combinación de cabeza de perforación y plataforma giratoria. En la práctica ha resultado extraordinariamente efectiva para los trabajos de completar y limpiar pozos. El tipo "H" de cabeza de perforación se diferencia de los tipos "E", "F" y "G" en que lleva una plataforma giratoria, en comprende bujes para manguitos corredizo y kelly, como parte integrante de la cabeza. Un árbol propulsor dispuesto en la cabeza "H" puede contectarse al torno de extracción, motor eléctrico o motor de gas. En esta cabeza, el buje del kelly da rotación al kelly. La fuerza se deriva del árbol propulsor. Ensayada a 3000 libras. Recomendada para presiones de trabajo hasta de 1.500 libras.

Write for complete new catalog, or other specific information.

THE GUIBERSON CORPORATION

Dallas, Texas, U. S. A.

Maracaibo · Export Office: 30 Rockefeller Plaza, New York, N. Y. · Trinidad

CONTROL HEAD PACKERS

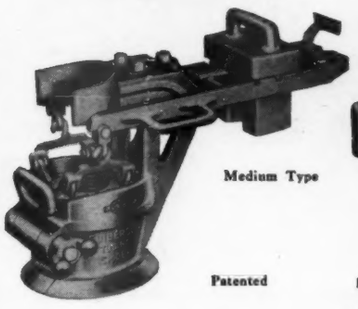
Type C-1 Type G-2 Drillable Aluminum Packer

Guiberson patented Control Head Packers possess several exclusive advantages: 1. Valve at top permits running in against heavy flows, oil and gas passing upward through packer; 2. Passage can be opened through packer at will after setting, by simply raising tubing; 3. Packer can be reset higher or lower at will; 4. No swabbing effect, coming out, as valve opens. Drillable Packers are available where there is a possibility of having to drill out the packer due to certain well conditions. The same sizes are available as in the regular Type "K" and Type "KV" Packers. The long 30" opening entirely eliminates all nozzling effect at the valve, removes all risk of changing seat position of packer when opening valve, and permits a long powerful stroke, or jar to dislodge slips for repair when unseating the packer.

OBTURADORES DE CABEZA DE CONTROL

Los obturadores de cabeza de control Guiberson patentados poseen varias ventajas exclusivas: 1. La válvula superior permite introducir, en posición a una fuerte corriente, el petróleo y el gas que pasan hacia arriba a través del obturador; 2. A voluntad se puede abrir paso, a través del obturador, después de colocado, sencillamente levantando la tubería; 3. Se puede colocar el obturador más arriba o más abajo, a voluntad; 4. No hay efecto de escobillón al salir, pues la válvula se abre; 5. Se emplea empaquetadura de Neoprene con los obturadores G, la cual es a elección con el C-1. Esta empaquetadura es resistente al petróleo y no se atasca. Los tipos mostrados son el C-1 con una sola pieza de caucho corriente o grafitado o de Neoprene; G-2 con dos piezas de Neoprene. El tipo "KVB" es un obturador especial proyectado para usarse donde existe la posibilidad de tener que perforar el obturador debido a ciertas condiciones del pozo. Se ofrecen los mismos tipos, iguales a los corrientes "K" y "KV". La larga abertura de 30" evita todo efecto de boquilla en la válvula, evita todo riesgo de cambiar la posición del asiento del obturador, al abrir la válvula, y permite una carrera larga y fuerte, o percusión para quitar los manguitos, para la reparación, cuando el obturador se levanta de su asiento.

TUBING SPIDERS



Medium Type

Patented

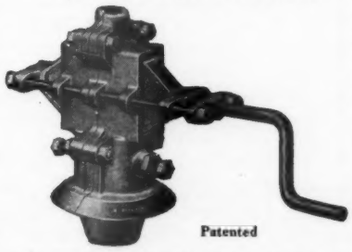
The GUIBERSON Tubing Spider offers two outstanding advantages over others, in its new patented Guide Head, and its arrangement for controlling slips with one lever. The adjustable Guide Head guides tubing to exact center of bore, causing slips to seat accurately. Operator then controls slips by means of the lever. Weight can be set so slips ride tubing when coming out, and automatically grip it if it falls—or so slips retract when tubing is lifted. Heavy type handles 2" to 4" tubing in any depth well. Medium type handles 2" to 3" tubing and will support 5000 feet of 3" upset tubing.

CRUCETAS PARA TUBERIA

Patentados

La cruceta GUIBERSON para tubería ofrece dos ventajas sobresalientes sobre todas las demás, que son su nueva cabeza de guía patentada y su dispositivo de control de sujetadores accionado mediante una sola palanca. La cabeza de guía ajustable guía la tubería por el centro exacto del agujero, lo que permite que los sujetadores se coloquen con precisión. El operario controla entonces los sujetadores mediante una palanca. El peso puede entonces ajustarse de modo que los sujetadores queden sueltos sobre la tubería mientras ésta va saliendo, pero agarrándola y reteniéndola automáticamente en caso de que tienda a bajar o caerse, o sencillamente retrayéndose cuando se va sacando o levantando la tubería. El tipo pesado sirve para tubería de 2" a 4", en pozo de cualquiera profundidad. El tipo mediano sirve para tubería de 2" a 3" y puede soportar 5.000 piés de tubería reforzada de 3 pulgadas.

WIRE LINE OIL SAVER



Patented

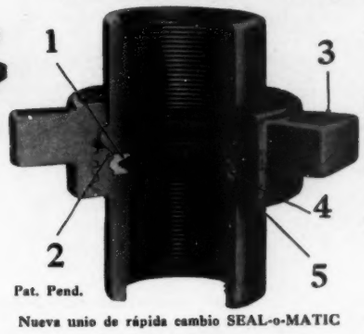
The GUIBERSON Wire Line Oil Saver is the outstanding device of its kind. Its patented method of adjusting both rubbers simultaneously and uniformly by turning one crank insures equalized pressure and uniform wear on rubbers. 500 pounds test. Easiest to operate. Perfected in every detail.

ECONOMIZADOR DE PETROLEO PARA CABLE

Patentado

El economizador de petróleo GUIBERSON para cable es el aparato más notable de su clase de hoy día. Su método patentado, que regula las dos piezas de caucho simultánea y uniformemente, girando una manivela, asegura una presión compensada y un desgaste uniforme en las piezas de caucho. Ensayado a 500 libras. Operación sumamente fácil. Perfeccionado en todo sentido.

NEW SEAL-o-MATIC QUICK CHANGE UNION



Pat. Pend.

Nueva unio de rápida cambio SEAL-o-MATIC

1.
THE SEAL-o-MATIC RING—AUTOMATICALLY SEALS BOTH HIGH AND LOW PRESSURES

1.
EL ANILLO SEAL-o-MATIC—CIERRA AUTOMATICAMENTE LAS ALTAS Y LAS BAJAS PRESIONES

2.
STEEL TO STEEL CONTACT CONFINES SEAL-o-MATIC RING

2.
CONTACTO DE ACERO CONTRA ACERO CONFINA AL ANILLO SEAL-o-MATIC

3.
WING NUT MAKES OR BREAKS WITHOUT WRENCHES

3.
TUERCA DE ORBJA PARA ABRIR Y CERRAR SIN LA AYUDA DE LLAVES

4.
INNER SHIELD PROTECTS SEALING RING

4.
EL RESGUARDO INTERIOR DA PROTECCION AL ANILLO DE CIERRE

5.
QUICK THREAD

5.
ROSCA RAPIDA

DESCRIPTION

A NEW Quick Change Union utilizing the force of pressure to automatically effect a seal against either high or low pressures with the SEAL-o-MATIC RING, which is made of a molded, flexible, oil resisting compound. A positive seal is attained independent of the tightness of the wing nut. Field replacement of the Ring is easily accomplished. Maximum misalignment of the Union will not disturb the seal. Hubs are turned from special high tensile solid steel bars. A 2" stock SEAL-o-MATIC Union has passed the gruelling test of 19,500 lbs. pressure without failure of either the flexible Sealing Ring or the Union.

DESCRIPCION

Una nueva union de rápido cambio, que utiliza la fuerza de la presión para efectuar un cierre contra las altas o las bajas presiones. La acción de cierre automático se efectúa con el ANILLO SEAL-o-MATIC, el cual se hace de una composición moldeada flexible de gran resistencia al petróleo. Se obtiene un cierre positivo independiente de la apretadura de la tuerca de oreja. La renovación del anillo en el campo se hace con facilidad. La desalineación máxima de la unio no perturba el cierre. Los ubos se tornean de barras de acero macizas de gran resistencia de tracción. Una unión SEAL-o-MATIC de material de 2" ha pasado el exigente ensayo de 19.500 libras de presión, sin notarse falta en el anillo de cierre flexible o en la unión.

CUP PACKER TYPE "GW"

Designed for operators who prefer a Cup Type Packer.

The same principle of effecting a positive seal, as employed in the famous Guiberson Swab Cup, is used in the "GW" Packer. Tubing weight or other mechanical means are not required to expand this packer. Cups automatically expand with well pressure.

Extremely flexible lip assures pack-off at both high and low pressures. Cups contain special reinforcing and will stand hydrostatic pressures of 6,000 lbs. per square inch. Many field applications have proven the "GW" Packer Cup.

Cup Packer Pat. & Pat. Pend.

OBTURADOR O TAPON DE COPA, TIPO "GW"

Proyectado para los que prefieren un tipo de copa.

El mismo principio de efectuar un cierre positivo, que se emplea en la famosa copa de escobillón Guiberson, se usa en el obturador o tapón "GW". El peso de la tubería u otros medios mecánicos no se necesitan para ensanchar este obturador. Las copas se ensanchan automaticamente con la presión del pozo.

El labio extremadamente flexible asegura un cierre seguro a altas y bajas presiones. Las copas contienen un refuerzo especial y resisten presiones hidrostáticas de 6.000 libras por pulgada cuadrada. El tapón de copa "GW" ha dado muy buenos resultados en muchas aplicaciones prácticas.

TUBING CATCHERS

Type E is for wells of any depth—Type B for wells under 4,000 feet—Type F for extremely deep wells. A few advantages: 1. Slips of larger and ample size operate accurately on dovetail tracks; 2. Load-Carrying parts are heat-treated alloy steel; 3. Special non-fatiguing spring; 4. Largest by-pass area. In pumping wells use GUIBERSON Tubing Catcher Anchor, shown at left below, with catcher, for increased pumping efficiency.

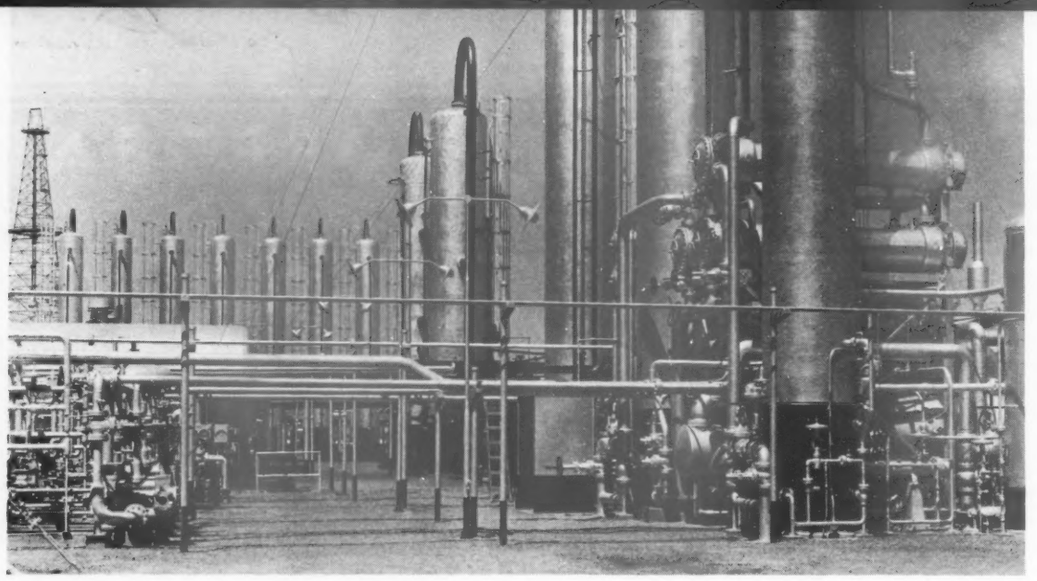
Type E

ATRAPADOR DE TUBERIA

La GUIBERSON fué la introductora del atrapador automático de tubería y ofrece ahora el surtidó más completo del mundo, de estos productos. El tipo E es para pozo de cualquier profundidad —el tipo B, para pozos de menos de 4.000 piés—el tipo C, para pozos con revestimiento delgado o defectuoso.

Entre otras ventajas citamos aquí las siguientes: 1. Sujetadores de tamaño convenientement grande funcionan con seguridad en vías a estilo de cola de milano; 2. Las piezas que llevan la carga son de acero especial tratado térmicamente; 3. Resorte especial de gran duración; 4. Superficie de derivación máxima. Para los pozos de corriente natural, recomendamos el empleo de la ancla atrapadora de tubería GUIBERSON, mostrada a la derecha, con el atrapador de tubería, para aumentar el rendimiento del bombeo.

Pídanos ejemplar de nuestro nuevo catálogo e información específica.



Absorption columns, stills, stabilizer, towers and heat-exchanging equipment for extracting butane and isobutane cuts in a California natural-gasoline plant

Columnas de absorción, serpentines, estabilizador, torre y equipo de cambio de calor, para la extracción de fracciones de butano e isobutano, en una instalación de gasolina natural en California

Natural Gasoline Progress

Progreso de Gasolina Natural

DESPITE low prices received for its products, the natural-gasoline industry this year continued to add new plants on a large scale, to make additions in capacity and improvements at older plants and to install facilities that would permit the manufacture of improved or more varied products. These market conditions did not offer encouragement for the small companies to construct new plants or add to existing facilities, therefore most of the new construction was undertaken by larger companies whose finances permitted them to accept a long-time payout. As a consequence much of the construction work took advantage of new processes, which in most cases require elaborate and large-capacity operations.

This is in decided contrast to the plant construction of earlier years when small plants simply recovered the heavier fractions from the gas and vented or burned as fuel the uncondensed fractions. Polymerization and the related processes of hydrogenation, alkylation, isomerization, etc., have been made available to the refining industry, and the natural-gasoline manufacturer has found that hydrocarbon fractions once considered a nuisance are now desirable as charging stocks for these processes. Thus, construction usually provided for the recovery of propane and butanes, and to some extent, commercial isobutane.

Another factor affecting the choice of plant type and construction is the increasing use of natural-gasoline-plant equipment as part of a pressure-maintenance or recycling operation. In so doing it is generally required that higher operating pressures be used, the gas stripped of hydrates so that freezing of lines and facilities is eliminated and that the plant be sufficiently flexible in operation to meet changing requirements of the recovery project. To provide this flexibility a higher investment per plant is necessary.

Markets

The past year marked an increasing volume of the natural-gasoline plant's production being converted into synthetic products and much of it moved to refineries as base stocks for aviation gasoline. However, the great bulk of the output was used as a blending agent for increasing the volatility and antiknock value of motor fuels. And this will probably remain the condition so long as 44 per cent of the motor fuels produced is made up of low-volatility straight-run gasoline, or until a still cheaper method is found for bringing the volatility of motor fuels up to present-day requirements.

The natural-gasoline manufacturer, through installation of certain facilities which permit the recovery of hydrocarbons hitherto consigned to waste, may bolster his income to some extent, but his annual profits will probably always be determined

(Continued on Page 272)

APESAR del bajo precio recibido por su producto, la industria de la gasolina natural continuó este año añadiendo nuevos establecimientos, en grande escala, para hacer adiciones en capacidad y mejoramientos en las instalaciones más antiguas, y para instalar facilidades que permitan la manufactura de productos perfeccionados o más variados. Estas condiciones del mercado no ofrecieron aliciente a las compañías pequeñas para construir nuevas instalaciones o ensanchar sus facilidades existentes; por esta razón, casi toda la nueva construcción fué emprendida por las empresas más grandes, cuyos recursos financieros les permite aceptar una inversión a largo plazo. Como consecuencia, gran parte del trabajo de construcción aprovechó nuevos procedimientos, los cuales, en gran medida, requieren operaciones muy elaboradas y de extensa capacidad.

Todo esto está en decidido contraste con la construcción de instalaciones en los primeros años de la industria, cuando los establecimientos pequeños sencillamente recuperaban las fracciones más pesadas del gas y dejaban escaparse o quemaban como combustible las fracciones incondensadas. La polimerización y los procedimientos afines de la hidrogenación, alcalización, isomerización, etc., quedaron a la disposición de la industria de la destilería o refinería, y el fabricante de gasolina natural ha visto que las fracciones de hidrocarburos que antes consideraba una inconveniencia, son ahora muy apetecibles como materiales de carga para estos procedimientos. En vista de esto, la construcción de nuevas instalaciones comprende las necesarias facilidades para la recuperación de propano y butanos, y hasta cierto punto, del isobutano comercial.

Otro factor que afecta la selección del tipo de instalación es el creciente uso del equipo de planta de gasolina natural, como parte de una operación de mantención de presión o de repaso. En este caso, se requiere generalmente el uso de mayores presiones de trabajo. El gas queda desprovisto de hidratos, para eliminar el peligro de congelación de la tubería y otros equipos, y la instalación tiene necesariamente que ser bastante flexible en operación para adaptarse a los cambios de requisitos del proyecto de recuperación. Para proveer esta flexibilidad se requiere una mayor inversión de capital por cada planta.

Mercados

El año pasado presenció una creciente cantidad de producción de planta de gasolina natural convertida en productos sintéticos, y gran parte de ella fué a las refinerías, como material básico, para gasolina de aviación. Sin embargo, le mayor parte de la producción fué usada como agenta de mezcla para aumentar la volatilidad y el índice antidetonante de los combustibles de motor. Y esto

(Continue en Pagina 272)

. . . DE MATERIALES PETROLIFEROS, BUTANOS Y PROPANOS—LOS PROCEDIMIENTOS POLIFORME Y REVERSION DE GAS

Bajo las patentes de la Gulf Oil Corporation y la Phillips Petroleum Company, Lummus proyecta, construye y da permiso para la utilización de las unidades ó instalaciones que funcionan por los procedimientos poliforme y reversión de gas, que producen:

—material básico para gasolina de aviación.

—toluol.

—gran rendimiento total de gasolina de motor de alto número octano, con buenas características de destilación, color, gomosidad, estabilidad de oxidación, valor de mezcla y susceptibilidad al plomo.

—Indice de octano de 85 a 95, determinado por el ensayo método de investigación ("Research Method").

—una diferencia entre el índice de octano, método motor CFR-ASTM y el del método de investigación de 9 a 14 números, y entre el índice de octano, CFR-ASTM y el del "Road Test" de 3 a 8 números.

Pídanos información detallada sobre los procedimientos poliforme y reversión de gas.

THE LUMMUS COMPANY, 420 Lexington Avenue, NEW YORK, N. Y.
600 SOUTH MICHIGAN AVENUE, CHICAGO, ILL. • 411 WEST FIFTH STREET, LOS ANGELES, CAL. • 3020 WROXTON AVENUE, HOUSTON, TEXAS
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LUMMUS

PETROLEUM REFINING PLANTS

(Continued from Page 268)

by values or prices placed upon motor fuels.

This was especially true in the past year when natural-gasoline prices received by the manufacturer were the lowest in 5 years, despite production being kept fairly well within demand requirements. While export markets were greatly reduced by the warfare in Europe, and this factor no doubt contributed to the weakness of the natural-gasoline market, a nominal increase in domestic sales served greatly to offset this loss. Thus the weakness of the natural-gasoline market, on the whole, can be attributed only to low refinery prices of motor fuels that prevailed during the entire year.

The commercial development of polymerization and related processes has greatly increased the market for butanes and propane, and more and more gasoline plants are being equipped for their recovery. However, there is a limit to this practice and in many instances the operators of gasoline plants cannot justify their installation. In their present state of development, these processes cannot be adopted to small-scale operations due to their relatively high-unit investment.

In the domestic market or "bottled gas" industry, high transportation and marketing costs are encountered, possibly exceeding the plant facility cost by several times. These preclude the small natural-gasoline manufacturer from marketing his production. Therefore it is probable that the industrial market, or where sales are by tank-car lots, offers the brightest outlook at the present for the average small plant equipped with butane-propane recovery facilities.

Repressuring

As stated earlier, several pressure-maintenance or repressuring operations were undertaken in oil-producing fields and a large number of recycling programs placed under way in distillate-producing fields. These projects served to make the natural-gasoline and oil-producing branches more and more dependent upon one another. And, in view of state regulatory bodies and operators in general continually attempting to improve upon present producing methods to the end that ultimate recoveries are increased, these two branches should continue to become more interdependent.

An outstanding development along this line was the placing of the K.M.A. field of North Texas under a full-scale pressure-maintenance program. At this project 134 operators unitized all available gas in the field, which now covers 30,000 producing acres, and this gas is processed in five plants where it is boosted to 1,200 to 2,000 lb. and returned to the field. In this instance the nature of the producing horizon and the large acreage made it more desirable to process the gas in five plants throughout the field, rather than in one centrally located plant.

Trends in Operation

In so far as natural-gasoline plants are concerned, new units constructed were characterized chiefly by their higher operating pressures, wider use of refrigeration for cooling the absorption-oil stream, greater attention to cooling and heat exchanging, and installation of safety and automatic devices that serve to make a plant's operation as safe and foolproof as possible. Also, in absorption-type plants, use of low molecular-weight oil is increasing, with many of the new plants containing equipment for reconditioning the oil while in service.

Demand for the lighter hydrocarbon fractions lead natural-gasoline manufacturers to give increased attention to absorbing a wider range of hydrocarbons from the raw gas instead of allowing them to remain in the residue gas. One process recently developed involves presaturating the lean oil in an absorber with all the plant vent gases, from which all the desired salable fractions have been removed. The presaturated oil, heated by the latent heat and heat of solution of these constituents, is then cooled and pumped into the main absorbers. This method acts to reduce the temperature rise in the main absorber, thereby increasing the selectivity of absorption and making possible the absorption of the desired components without as large an absorption of "fixed gases." With the high gas-oil ratio so obtained it is often possible to absorb all the butane, all the propane and considerable quantities of methane and ethane contained in the vent gases, thereby increasing the absorption efficiency.

In the new plants constructed this year, and in several instances where remodeling work was done, many provided for cooling the absorption oil by propane or butane-propane mixtures. Facilities for these refrigeration units consist essentially of equipment for recompressing the refrigerating medium (propane and/or butane), condensers, surge tank, evaporator and chillers. Through their use the temperature of the lean oil is lowered to the neighborhood of 40°-45° F., thereby increasing greatly the percentage of butanes and lighter hydrocarbons recovered from the raw gas. While refrigeration has been employed at some gasoline plants in the past, its use is becoming more widespread as manufacturers seek more and more to recover as much of these hydrocarbons as is economically possible.

In general, absorption operations are being carried out at high pressures in order to take advantage of the reduced oil-circulation rate made possible and to obtain a higher stripping efficiency in so far as the lighter hydrocarbons are concerned. Also as

(Continued on Page 276)

(Continue desde Pagine 268)

probablemente continuará como una condición corriente mientras el 44 per ciento, más o menos, de los combustibles de motor producidos, se haga con gasolina o esencia de destilación de baja volatilidad, o hasta que se descubra un método más económico para aumentar la volatilidad de los combustibles de motor a los requisitos actuales.

El fabricante de gasolina natural, gracias a la instalación de ciertas facilidades que le permiten la recuperación de hidrocarburos hasta ahora desperdiciados, puede incrementar sus ganancias, hasta cierto punto, pero sus entradas anuales probablemente serán siempre determinadas por los valores o precios puestos sobre los combustibles de motor.

Esto fué especialmente cierto el año pasado, cuando los precios de la gasolina natural recibidos por el fabricante fueron los más bajos en 5 años, a pesar de haberse mantenido la producción bien de acuerdo con los requisitos de la demanda. A pesar de que los mercados de exportación fueron grandemente limitados por la guerra en Europa, factor que sin duda alguna contribuyó a la debilidad del mercado de la gasolina natural, un aumento nominal en ventas en el mismo país sirvió efectivamente para compensar esta pérdida. Por esta razón, la debilidad del mercado de la gasolina natural, en términos generales puede atribuirse sólo a bajos precios de refinería de los combustibles de motor que han prevalecido durante todo el año.

El desarrollo comercial de la polimerización y procedimientos afines ha aumentado grandemente el mercado para butanos y propano, y más y más plantas de gasolina se están equipando para su recuperación. Sin embargo, hay un límite para esta práctica, y en muchos casos, los dueños de plantas de gasolina no pueden justificar su instalación. En su presente estado de desarrollo, estos procedimientos no pueden adoptarse a operaciones en pequeña escala, debido a la inversión relativamente grande que representan.

En la industria del "gas embotellado," en el mercado nacional, se presentan subidos costos de transporte y venta, los cuales posiblemente exceden varias veces el costo de las facilidades de la planta. Estos gastos impiden al pequeño fabricante de gasolina natural el vender su producción. Por esta razón, es muy probable que el mercado industrial, en que las ventas se hacen por lotes de vagones tanques, ofrece las mejores expectativas, al presente, a las plantas pequeñas equipadas con facilidades para recuperación de butanos y propano.

Represion

Como lo hemos dicho ya, varios trabajos de represión y mantención de presión se emprendieron en campos petrolíferos, y un gran número de programas de repaso se llevaron a cabo en lugares de producción de destilados. Estos proyectos sirvieron para hacer más mutuamente dependientes las actividades de producción de gasolina natural y de petróleo. Y en vista de que los cuerpos regulatorios del estado y los mismos explotadores están continuamente tratando de mejorar sus presentes métodos de producción, a fin de aumentar las recuperaciones finales, estas dos ramificaciones de la industria continuarán indefinidamente en creciente interdependencia.

Un desarrollo sobresaliente en este sentido fué la colocación del campo K.M.A. en el norte de Texas, sobre un programa de mantención de presión de completa escala. En este proyecto, 134 explotadores unificaron todo el gas disponible en el campo, el cual cubre ahora como 30.000 acres productores, y este gas es preparado en cinco plantas, donde es comprimido de 1.200 a 2.000 libras y devuelto al campo. En el presente caso, el caracter del horizonte productivo y la gran extensión hacen más conveniente tratar el gas en cinco plantas en el mismo campo, que hacer todo el trabajo en una sola instalada en punto central.

Tendencias en la operacion

En lo tocante a plantas de gasolina natural, las nuevas instalaciones construídas se caracterizaron principalmente por sus mayores presiones de trabajo, mayor uso de la refrigeración para el enfriamiento de la corriente de petróleo de absorción, mayor atención al enfriamiento y cambio de calor, e instalación de dispositivos de seguridad y automáticos, que sirven para facilitar el funcionamiento de toda la instalación sobre una base más segura. También, en las plantas de tipo absorción, está aumentado el uso del petróleo de bajo peso molecular, en conexión con las nuevas instalaciones que contienen equipo para acondicionar de nuevo el petróleo mientras está en servicio.

La demanda de fracciones de hidrocarburos más livianos conduzco a los fabricantes de gasolina natural a dar mayor atención a la absorción de una mayor escala de hidrocarburos del gas crudo, en lugar de permitir que se queden en el gas de residuo. Un procedimiento recientemente desarrollado comprende la presaturación del petróleo delgado en un absorbedor con todos los gases de la planta de los cuales se han extraido todas las fracciones vendibles. El petróleo presaturado, calentado por el calor latente y el calor de la solución de estos constituyentes, es entonces enfriado y por medio de bomba, inyectado en los absorbedores principales. Este método sirve para reducir el alza de temperatura en el absorbedor principal, aumentando así la selectividad de la absorción y haciendo posible la absorción de los deseados componentes, sin una gran absorción de "gases fijos." Con la alta relación de gas y petróleo así obtenida, es, a menudo, posible, absorber todo el butano, todo el propano y considerables cantidades de metano y etano contenidas en los gases de escape,

(Continue en Pagine 276)

SPECIFY "Varec" APPROVED TANK EQUIPMENT & SAFETY DEVICES

"The Pace Setter Since 1928" — *"La norma desde 1928"*

Figure No. 58A

CONSERVATION VENT UNIT FOR TANKS

Pressure & Vacuum Relief Valve with Hyperbolic Pallets, & Flame Arrester with extensible bank. Greater flow capacity. All aluminum. Noncorrosive. Inside Flame Snuffer. Fully listed by the Underwriters' Laboratories. Sizes 2" to 10".

UNIDAD DE RESPIRACION PARA CONSERVACION DE TANQUES

Válvula de desahogo de presión y vacío con paletas hiperbólicas y detenedor de llama con banco extensible. Mayor capacidad de corriente. Toda de aluminio. No puede corroerse. Apagador de llama interior. Completamente aprobado por los laboratorios de compañías de seguro. Tamaños de 2 a 10".

Figure No. 40

Figure No. 220

GAUGE AND THIEF HOLE COVER

Aluminum. Noncorrosive. Gastight. Self-closing. Nonsparking. Also Pressure Types. Sizes 4" to 10".

INDICADOR Y TAPA DE PROBADOR DE MUESTRA

De aluminio. No puede corroerse. Hermético al gas. Cierre automático. No produce chispa. También tipos de presión. Tamaños de 4 a 10".

MANHOLE COVER

Semisteel cover, steel cross beam, sparkproof bushings & seating contacts. Gastight. Riveting, Bolting or Welding. Sizes 18" and 20."

CUBIERTA DE PASO DE HOMBRE

Cubierta o tapa de semiacero, con viga transversal de acero, bujes y contactos de asiento a prueba de chispa. Hermética al gas. Remachada, asegurada por pernos o soldada. Tamaños de 18 y 20".

GASTIGHT GAUGING AND SAMPLING UNIT

Accurate gauges, temperatures, and spot or running samples. Cast aluminum Portable Head, semisteel Body, and Plug Gate Valve. All 18-8 stainless steel and bronze trim. Pressure 50-lbs. Sizes 2" and 4". Thermometer and Sampling Bomb optional.

UNIDAD DE INDICADOR Y PROBADOR DE MUESTRA HERMETICA AL GAS

Indica exactamente las temperaturas y prueba muestras fijas o corrientes. Cabeza portátil de aluminio fundido, cuerpo de semiacero y válvula de compuerta de tapón. Acero inoxidable de 18-8 y guarniciones de bronce. Presión de 50 libras. Tamaños de 2 a 4". Termómetro y dispotivo de muestra a elección.

Figure No. 410

GASTIGHT AUTOMATIC TANK GAUGE

Adaptable to *any type* or size of tank by proper fittings. Available for any working pressure. Accurate to 1/16 in. Gravity Compensator adjusts for changes in gravity when fluid is changed. Sparkproof, noncorrosive, inexpensive.

MANOMETRO AUTOMATICO DE TANQUE HERMETICO AL GAS

Se adapta a cualquier tipo o tamaño de tanque mediante correctas conexiones. Se ofrece para cualquiera presión de trabajo. Exacto hasta 1/16". El compensador de gravedad se adjusta a los cambios de peso específico cuando se cambia el líquido. A prueba de chispa no se corroe. De precio económico.

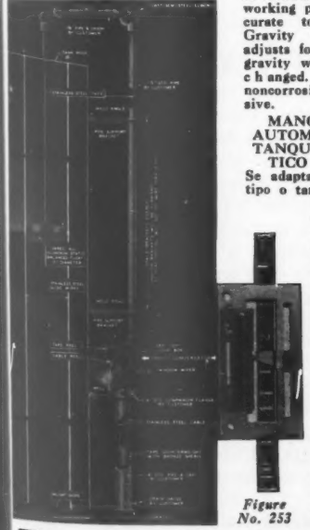


Figure No. 253

SAFETY TANK WINCH

Rated capacities 1500-lbs., 2500-lbs., 5000-lbs., with only 50-lbs. handle load. Designed for 100% overload. Timken Thrust Bearings. Bronze Bushings. Worm gear construction. Positive lock.

Figure No. 157

MALACATE DE TANQUE DE SEGURIDAD

Capacidades nominales de 1500, 2500, 5000 libras, con sólo 50 libras de carga de mango. Construido para una sobrecarga de 100%. Cojinetes de empuje Timken. Bujes de bronce. Construcción de engranaje de tornillo sin fin. Cierre positivo.

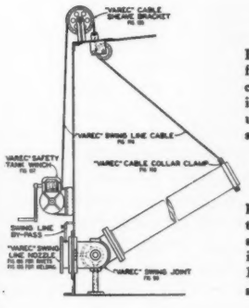
CABLE SHEAVE BRACKET

For all types of tank roofs, with or without lubricated packing gland to fit any size cable; with or without demountable top. Available for Welding, Riveting, or Bolting.

SOSTEN DE ROLDANA DE CABLE

Para todo tipo de techo de tanque, con o sin prensaestopa lubricado, para daptarse a cualquier cable; con o sin tope desmontable. Unión por soldadura, remanche o perno.

Figure No. 135


"VAREC" CABLE SHEAVE BRACKET FIG. 135
"VAREC" SWING LINE CABLE
"VAREC" CABLE COLLAR CLAMP FIG. 113
"VAREC" SAFETY TANK WINCH FIG. 157
SWING LINE BY-PASS
"VAREC" SWING LINE NOZZLE FIG. 305 FOR WELDING FIG. 306 FOR RIVETING
"VAREC" SWING JOINT FIG. 90

SWING LINE ASSEMBLY

Installation diagram of fittings shown in this column. Ask for Drawing C-S-19 to see "pull-up" with "pull-down" assembly.

GRUPO DE LINEA GIRATORIA

En esta columna mostramos diagrama de instalación de las conexiones. Pida plano C-S-19 para ver el grupo de subida y de bajada.

SWING JOINT

Progressively expanding passageways. Streamline flow capacity. Tongue and grooved joint. Cast Iron. Flanged or screwed. Cannot leak. Sizes 2" to 10".

UNION GIRATORIA

Conductos de extensión progressiva. Capacidad máxima de corriente de paso. Unión ranura y lengueta. De hierro fundido. Con reborde o roscs. No produce escape. Tamaños de 2 a 10".

Figure No. 90

SWING LINE NOZZLE

Bolting, Riveting, or Welding to tank shell. Flanged for outside piping and studded inside to receive flanged Swing Joint. Screwed connections as required. Any series flanges as specified. Sizes 3" to 10".

BOQUILLA DE LINEA GIRATORIA

De conexión por pernos, remaches o soldadura al casco del tanque. Con reborde para tubería exterior y ranurada por dentro para admitir unión giratoria con reborde. Conexiones de tornillo, como se pidan. Cualquier tamaño de reborde que se especifique. Tamaños de 3 a 10".

Figure No. 304

"VAREC" *Approved* PRODUCTS
"VAREC" productos APROBADOS

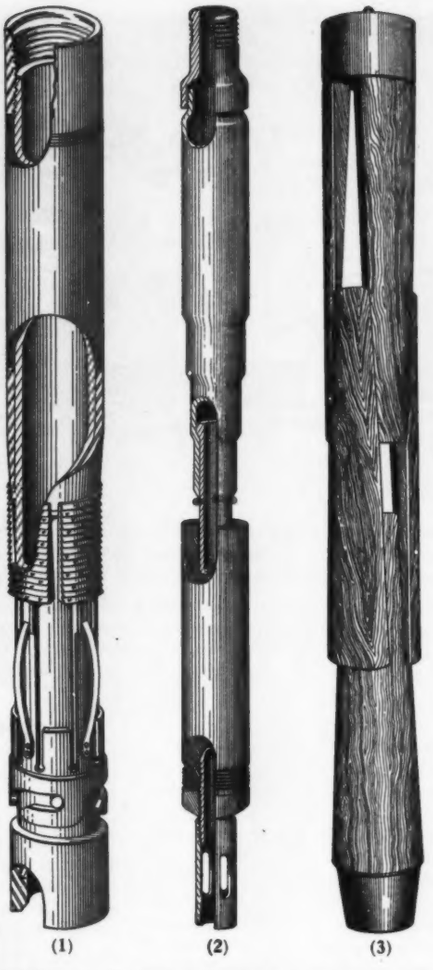
Guaranteed to give satisfaction for service recommended.

Se garantizan que dan satisfacción en el servicio para el cual se recomiendan.

Cable Address: "VAREC", COMPTON CALIF.
Dirección telegráfica: "VAREC" COMPTON, CAL.

"The Pace Setter Since 1928" — *"La norma desde 1928"*

THE VAPOR RECOVERY SYSTEMS CO., COMPTON, CALIFORNIA, U.S.A.
NEW YORK CITY -- HOUSTON, TEXAS -- CLEVELAND, OHIO -- TULSA, OKLAHOMA



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RED PACKERS PACK!

LOS TAPONES RED OBTURAN!

All Types and Sizes

Robinson RED Packers, developed through years of research, are furnished in all types of wall and anchor packers, in both tubing and casing sizes.

Shown above are: (1) Hook Wall Packer—for use in either open hole or casing. (2) Three-in-one Packer—used for shutting in gas wells and flowing oil wells. Packs in open hole. (3) Limit Plug—for plugging off water at bottom of hole or at lower levels in the production of shallow sands.

A type to meet *every* packing problem! Also swage nipples, bull plugs, and casing shoes.

At leading supply stores. Write for catalog today.

De todo tamaño y tipo

Los tapones Robinson RED, resultado de muchos años de estudio, se suministran en todo tipo de pared y anclaje, en tamaños adaptados a cualquiera tubería o revestimiento.

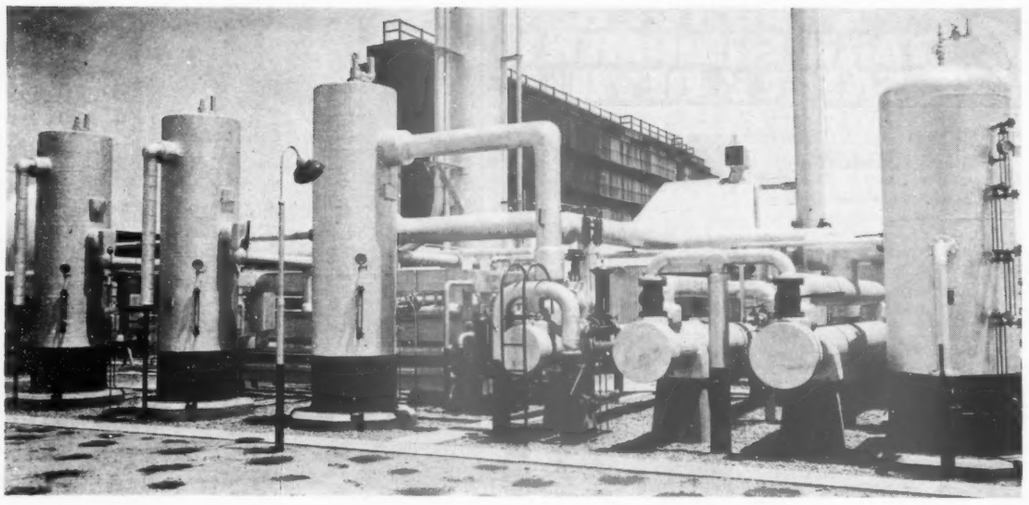
Mostramos arriba: (1) tapón de gancho mural—para uso en agujero abierto o tubos de petróleo. (2) Tapón "Tres en uno"—usado para obturar pozos de gas y pozos brotantes de petróleo. (3) Tapón de límite—para cerrar el agua en el fondo del agujero o a niveles más bajos en la producción de arenas de poco fondo.

Un tipo para resolver cualquier problema de tapón. También niples, tapones gruesos para tuberías y zapatas de tubos. Se venden por las firmas principales del ramo. Pídanos catálogo en seguida.

ROBINSON PACKER COMPANY

General Office & Store: 210 N. Main St. Tulsa, Oklahoma

Factory: 13th & Spruce St. Coffeyville, Kansas



Natural-gasoline plants serving as booster plants in pressure-maintenance operations generally utilize higher operating pressures, and thereby encounter increased difficulty with hydrate formation. At the dehydration unit shown here, diethylene glycol and refrigeration are used to reduce dew point of the high-pressure residue gas to almost 0° F.

Las instalaciones de gasolina natural, que sirven de plantas amplificadoras en las operaciones de mantención de presión, utilizan generalmente mayores presiones de trabajo, y por esta razón encuentran creciente dificultad con la formación de hidratos. En la planta de deshidratación que mostramos aquí, se usan glicol dietileno y refrigeración para reducir el punto de saturación y condensación del gas de residuo de alta presión, a casi 0 grado F.

(Continued from Page 272)

a means of stripping the gas of a maximum amount of its butanes and propane, wider use of reabsorbers was incorporated in the design of new plants. This is generally accomplished by the oil from the main absorber being passed to intermediate and low-pressure vent tanks where in each stage light gasoline fractions escape from the rich-oil stream and then are passed to reabsorbers where they are further scrubbed by lean-oil streams.

These higher absorption pressures, with the resulting greater amount of light fractions being absorbed in the rich oil, act to place a greater load on the stabilizing operation to obtain the degree of fractionation required. To accomplish this separation, added fractionation equipment in the form of debutanizing, depropanizing and deethanizing towers is required. In addition to various grades of natural gasoline, the output of many plants includes commercial cuts of propane, iso- and normal butane, iso- and normal pentane and special solvents. To accomplish this fractionation, of course, requires that such plants be highly flexible in operation in order to comply with market-demand requirements.

THE COVER

The cover picture of this section shows the Brazilian flag whipping from the top of a drilling rig on the eastern coastline of South America. The view, framed in equatorial palms and used through courtesy of the Oil Well Supply Co., typifies the pioneering spirit of the oil industry in exploring all corners of the earth.

Compression Equipment

Caused principally by the duties of the plant in recycling and pressure-maintenance operations, the trend is toward larger compressors operating at higher pressures. Despite the fact that units in many plants are required to compress the gas to 3,000 lb. or higher, compressor-packing leakage and compressor-rod wear are no higher than those experienced under normal compression conditions. The progress can be accredited only to the design, materials used and number of rings in the packing case, and to the system of lubrication employed. At these higher pressures improved design also allows the compressor valves to function with only normal attention and they give little or no trouble.

In regard to pumping equipment, whether steam driven or electric-motor driven, more and more units are being set in the open. Substantial foundations are usually set but the equipment is not housed. This, of course, serves to reduce substantially plant-construction costs.

Throughout the industry generally, there is a growing trend toward placing all piping, including high-pressure lines, aboveground or in concrete-lined trenches. This practice facilitates inspection and repair of the lines. In high-pressure operations, piping design must take into consideration any expansion requirements and still eliminate vibration. Generally on the compressor suction and discharge headers this problem is solved by a system of fixed central anchors, slip-type intermediate anchors limiting the pipe to longitudinal movement only, and horizontal expansion loops. In field lines the expansion and contraction is provided for by means of horizontal or vertical loops, located usually in or near the plant yard.

(Continue desde Pagina 272)

aumentando así el rendimiento de la absorción.

En las nuevas plantas construidas este año, y en varios casos en que se hizo trabajo de modernización, muchas instalaciones incluyeron facilidades para enfriar el petróleo de absorción con mezclas de propano, butano-propano. Las facilidades para estos grupos de refrigeración consisten esencialmente de equipo para la recompresión el medio da refrigeración (propano y butano-propano), condensadores, tanque, evaporador y enfriadores. Mediante su uso, la temperatura del petróleo ralo o delgado se baja a más o menos 40 a 45 grados F., aumentándose así el procentaje de butanos y de hidrocarburos más livianos recuperados del gas crudo. A pesar de que la refrigeración se ha empleado en algunas plantas de gasolina en el pasado, su uso se está difundiendo más a medida que los fabricantes tratan de recuperar más y más de estos hidrocarburos de la manera más económica posible.

En general, los trabajos de absorción se llevan a cabo a presiones más altas, para sacar provecho del régimen de reducida circulación de petróleo hecho posible, y obtener un mayor rendimiento de separación, en lo tocante a los hidrocarburos más livianos o volátiles. También, como un medio de extraer del gas una cantidad máxima de sus butanos y propanos, se ha incluido en las nuevas plantas un mayor uso de reabsorbedores. Esto se hace generalmente pasando el petróleo del absorbedor principal a tanques de presión intermedia y baja, donde en cada etapa se escapan las fracciones livianos de gasolina de la corriente de petróleo, pasándose éstas a reabsorbedores donde son de nuevo limpiadas por corrientes de petróleo delgado.

Estas más elevadas preciones de absorción, con la resultante mayor cantidad de fracciones livianas absorbida por el petróleo pesado, sirven para colocar una mayor carga en la operación de estabilización, a fin de obtener el grado de fraccionación requerido. Para realizar esta separación, se requiere adicional equipo de fraccionación, en la forma de torres para debutanizar, depropanizar y deetanizar. En adición a varios grados de gasolina natural, el rendimiento de muchas plantas comprende derivados comerciales de propano, butano, iso y normal, pentano iso y normal y solventes especiales. Para realizar esta fraccionación se requiere, por supuesto, de que semejantes plantas sean muy flexibles o adaptables en trabajo, para responder a los requisitos de la demanda del mercado.

Equipio de compresion

Debido principalmente a los trabajos de repasar y mantención de presión de la planta, la tendencia es hacia compresores más grandes, que funcionan a presiones más altas. A pesar del hecho que los compresores en muchas plantas tienen que comprimir el gas a 3.000 libras o más, el escape por las empaquetaduras y el desgaste de las piezas de los compresores no son más grandes que los que se presentan bajo condiciones de compresión normal. Este progreso se debe sólo a la construcción, materiales usados y número de anillos en las cajas de empaquetadura, además del sistema de lubricación empleado. A estas más altas presiones, la construcción perfeccionada permite también que las válvulas del compresor funcionen con sólo una atención corriente, provocando muy poca o ninguna molestia.

En relación con el equipo de bomba, ya accionado por máquina de vapor o por motor eléctrico, se están instalando más y más de estos grupos a la intemperie. Se requiere generalmente un cimiento bien firme. pero el equipo mismo no queda albergado. Esto, por supuesto, sirve para reducir mucho el costo de construcción e instalación del grupo.

En general, en toda la industria se presenta creciente tendencia hacia la colocación de toda la tubería, incluyendo la de alta presión, encima del suelo, o bien, en zanjas con revestimiento de hormigón. Esta práctica facilita la inspección y la reparación de la tubería. Para trabajo de alta presión, la construccion de la tubería debe tomar en consideración los requisitos de dilatación y al mismo tiempo, suprimir la vibración. Generalmente, en los cabezales de aspiración y descarga de los compresores, este problema se resuelve por un sistema de anclaje central fijo, con anclajes intermediarios del tipo corredizo para sólo limitar el movimiento longitudinal de la tubería, y con aros para la dilatación en sentido horizontal. En la tubería de campo, la dilatación y la contracción de la tubería se maneja mediante anillos o aros horizontales o verticales.

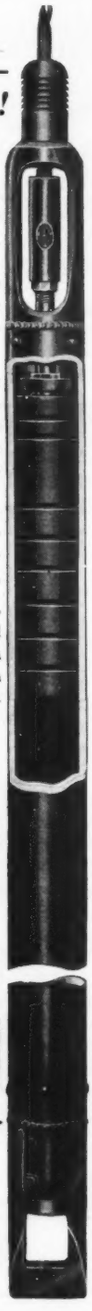
Clean Out WITH A MILLER

Limpie con la ayuda de una

MILLER

IN ANY LANGUAGE *means—*
increased production!

SPEED WITH CERTAINTY



For years MILLER Sand Pumps have been used by companies large and small in oil fields in every part of the world. The enormous suction created by the plunger action enables it to pick up a load greater than any other bailer. The wire line connection with the plunger permits the use of a longer tube.

Desde hace años, las bombas de arena MILLER se han empleado por compañías petroleras grandes y pequeñas, en todas partes del mundo. La aspiración enorme creada por la acción del émbolo permite a esta bomba extraer una carga más grande de la que puede ser extraida por cualquier otra bomba de su clase. La conección del cable metálico con el émbolo facilita el empleo de un tubo más large.

The MILLER is made in diameters of 2½, 3, 3½, 4, 4¼, 5, 5½, 7 and 9 inches and lengths of 20, 25 and 30 feet. 5/32-inch wall thickness in REGULAR Type, ¼-inch wall tubes HEAVY DUTY Sand Pumps.

WRITE FOR DESCRIPTIVE FOLDER AND PRICES

SEE COMPOSITE CATALOG AND DRILLING AND PRODUCING DIRECTORIES

INTERCHANGEABLE BOTTOMS
To Meet Every Condition

- **BAILER BOTTOM** — With the Bailer Bottom installed the MILLER is quickly changed to a Bailer giving you a combination of either Bailer or a Sand Pump in one tool.
- **SAND BOTTOM** — Used when tools are run and when well is shot to quickly remove loose material.
- **STAR BOTTOM** — Used for cutting the sand loose.
- **CHISEL BOTTOM (In Pump)** — With this bottom tightly packed sand can be easily broken in small pieces so it can be picked up in the pump.

MILLER Sand Pump Co.

PATENTED
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NO. 1787390
NO. 1952328
NO. 1966228
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General Offices & Factory:
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THE *Line Scale* . . . IS ALWAYS ACCURATE ! ! !

Formerly Known as the GREEN HEAD Line Scale

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The LINE SCALE is easily installed, and once properly adjusted gives uninterrupted service. You can read it at a glance. Actual weight is shown in pounds.

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● The LINE SCALE is supersensitive, yet rugged enough to withstand the hardest usage. It is absolutely accurate at all times because it is not affected by temperature changes. No fluid is used, hence no leaky connections to affect its accuracy. Just remember . . . LINE SCALE gives the CORRECT weight . . . at a glance!

Packer Jr.	40-75,000 lbs.	6" dial
Packer Spec'l	100,000 lbs.	8" dial
Conrad ____	180,000 lbs.	10"-12" dial
Reg. Driller	360,000 lbs.	12"-14" dial
Super _____	500,000 lbs.	14" dial
Recorder __	360,000 lbs.	12"-14" dial

Beam Sucker Rod Shock Absorbers

● Le "LINE SCALE" est extra-sensible, et pourtant d'une robustesse suifisante pour résister au plus dur usage. Il est d'une précision rigoureuse à tout moment car il n'est pas affecté par las changements de température. Aucun liquide n'est employé, de sorte qu'aucun raccord fuvant ne peut en affecter la précision. Notez bien . . que le "LINE SCALE" donne le poids JUSTE . . . d'un seul coup-d'oeil.

Packer Jr.	40-75.000 lbs.	6" dial
Packer Spec'l	100.000 lbs.	8" dial
Conrad ____	180.000 lbs.	10"-12" dial
Reg. Driller	360.000 lbs.	12"-14" dial
Super _____	500.000 lbs.	14" dial
Enregistreur	360.000 lbs.	12"-14" dial

● El pesador de tubería LINE SCALE es un instrumento supersensitivo, pero al mismo tiempo de construcción bien firme para resistir el servicio más exigente. Es absolutamente exacto, en todo momento, pues no es afectado por los cambios de temperatura. No emplea ningún líquido. Por esta razón no tiene conexiones con escape que afecten su exactitud. Sírvase recordar que el LINE SCALE de señala el peso CORRECTO . . . a la simple vista.

Packer Jr.	40-75.000 lbs.	6" dial
Packer Spec'l	100.000 lbs.	6" dial
Conrad ____	180.000 lbs.	10"-12" dial
Reg. Driller	360.000 lbs.	12"-14" dial
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McCORD LUBRICATORS

Standard Lubricators of the Oil Field

McCORD "SP" LUBRICATOR
FOR SLUSH PUMPS AND DRILLING ENGINES

The "SP" Lubricator is a development over a period of years to meet the demand for a strong rugged type of lubricator that would withstand vibration and continue to deliver uninterrupted service. The design and workmanship are of the highest type, working tolerances are extremely close, making the "SP" a most accurate and dependable lubricator. This lubricator will stand up under extreme conditions encountered in this service and continue to deliver uninterrupted service.

Features are: Removable pump units. Flexible oil delivery. Large clear sight feeds. Large capacity auxiliary reservoir tank.

Built to handle the heavy grades of oil, this lubricator is standard on Ajax steam drilling engines, National slush pumps, and Gardner-Denver drilling engines and slush pumps.

THE McCORD "LD" LUBRICATOR
DEPENDABLE—ACCESSIBLE—ECONOMICAL

The McCord Class "LD" Lubricator is the only one of the two plunger sight feed type that shows the oil is actually being delivered to the cylinder or part being lubricated. This is an exclusive McCord Safety feature which definitely shows at all times that the lubricator is functioning properly. In the McCord Class "LD" after the oil has passed through the sight feed glass, undetected leakage is impossible, an additional safeguard that makes for dependable service.

Pump units can be adjusted to deliver varying quantities of oil from a fraction of a drop to a constant stream, and at any and all speeds. The same quantity of oil is delivered when using a light oil as when using a heavy cylinder oil. Every McCord pump unit is tested against 2000 pounds pressure.

Reservoir capacities 1 qt. to 4 gal. Feeds 1 to 24—30 Standard sizes.

Catalog and Price List on Request.

McCORD CLASS "SF" LIQUID SIGHT FEED LUBRICATOR

1. Positive Oil Delivery at all Times.

McCord Class "SF" Lubricators have been designed to deliver oil at frequent and regular intervals, in a predetermined charge sufficiently large to maintain the oil film on moving surfaces.

2. Rugged Pump Construction.

McCord pump units are simple, sturdy and accurate, positive in operation and independently mounted. McCord pump units are the most accurate and efficient known.

3. Flexibility of Oil Delivery.

McCord Class "SF" Mechanical Lubricators have the most flexible and accurate oil delivery known. It is not necessary to disassemble any part of a McCord Class "SF" lubricator in order to make adjustments.

4. Removable Pump Units.

Any pump unit may be removed on the McCord Class "SF" Lubricator without stopping the lubricator, nor in any way interfering with its operation.

5. Adaptability to Source of Power.

Eighteen types of drive are provided on the McCord Class "SF". A McCord Class "SF" Lubricator may be placed anywhere, either directly on the machine or remote from it, according to the requirements of the job.

6. Taper Nozzle Gives Accurate Oil Delivery.

The size of the oil drop leaving the tapered sight-feed nozzle is approximately one gravity drop, the universal standard for measuring lubricants. The nozzle is readily removable giving access to the sight feed check ball.

THE McCORD TYPE "C" CHEMICAL MEASURING PUMP

The design of this McCord pump incorporates these important features:

(1) The ability to deliver a predetermined amount of liquid, proportioned according to the requirements, over a definite period of time, or a measured quantity, according to speed of the operating machine.
(2) Second only to accuracy is dependability and all units of the McCord pump are designed with long life and durability—an important consideration.
(3) Individual removable pump units make for easy adjustment, for quick removal for cleaning.
(4) All working parts are completely enclosed, operating in oil, fully protected from dust, dirt and the elements.
(5) The McCord design insures positive delivery of liquids even against pressure as high as 2,000 lbs.
(6) McCord engineering is further evident in the fact that the driving mechanism can be readily removed by taking out four bolts, providing it is desired to change to rotary or ratchet drive.

Accuracy of delivery is possible because of the finely engineered design with a minimum number of parts, carefully machined to McCord's close standards. All working parts are enclosed, fully protected from dust, dirt and the elements.

When used for the delivery or injection of chemicals into crude oil lines an auxiliary chemical tank, made of terneplate, of three-gallon capacity is provided. This tank is connected to the suction side of the pump. For this service pump units, made of steel, are used. (Pump units made of other alloys can be supplied.)

CAPACITY

The ½-inch plunger model delivers one pint of liquid in 261 plunger movements. The ⅛-inch plunger model delivers one pint of liquid in 464 plunger movements, while the 1/16-inch plunger model delivers one pint in 167 plunger movements. Catalog on request.

LUBRICADOR McCORD "SP" PARA BOMBAS DE LODO Y MAQUINAS DE PERFORAR

El lubricador "SP" es el resultado de muchos años de experiencia en la fabricación de lubricadores capaces de satisfacer la demanda de modelos bien firmes para resistir la vibración y seguros para dar un servicio continuo, sin interrupción. En tipo y construcción, estos lubricadores son de primer orden. Debido a sus limitados tolerancias de trabajo, los modelos "SP" son muy exactos y seguros. So prestan al servició más exigente y tienen una duración efectiva verdaderamente extraordinaria.

Sus rasgos principales son: Grupos de bombas separables. Entrega de aceite regulable. Alimentaciones visibles grandes y claras. Depósito auxiliar de gran capacidad.

Construcción adaptada el manejo de los aceites más pesados. El presente modelo es dotación normal en las máquinas perforadores de vapor Ajax, bombas National para lodo y máquinas de perforar y bombas de lodo de marca Gardner-Denver.

EL LUBRICADOR McCORD "LD" SEGURO — ACCESIBLE— ECONOMIO

El lubricador McCord, de clase "LD" es el único tipo de alimentación visible, de dos émbolos, que permite seguir con la vista la gota de aceita hasta que lleva al punto del cilindro o de cualquier otra parte, que ha de recibirla para su lubracción. Esto constituye un rasgo de seguridad exclusivo del lubricador McCord, que permite asegurarse, en cualquier momento, de que el lubricador está funcionando bien. En el lubricador McCord, después de que el aceite ha pasado por el vidrio de alimentación visible, el escape nunca puede pasar sin ser observado, lo que esuna adicional ventaja de seguridad de correcto servicio.

Capacidades del recipiente, de 1 cuarto de galón a 4 galones. Alimentaciones de 1 a 24-30 de tamaños normales.

A solicitud enviaremos catálogo y lista de precios.

LUBRICADOR LIQUIDO McCORD DE CLASE "SF" DE ALIMENTACION VISIBLE

1. Alimentación positiva de aceite en todo momento.

Los lubricadores McCord de clase "SF" han sido proyectados especialmente para alimentar aceite a intervalos regulares y frecuentes, con una carga determinada de antemano bastante grande para mantener una película de aceite sobre las superficies en movimiento.

2. Bombas de construcción bien firme.

Los grupos de bombas McCord son sencillos, firmes y precisos, de funcionamiento positivo y de montaje independiente. Los grupos de bombas McCord son los más eficaces del mercado.

3. Flexibilidad de la alimentación de aceite.

Los lubricadores mecánicos McCord de clase "SF" tienen la alimentación de aceite más flexible y más precisa que se conoce en la industria. No hay necesidad de desmontar ninguna pieza del lubricador McCord de clase "SF" para efectuar su regulación.

4. Grupos de bombas amovibles.

Del lubricador McCord de clase "SF" se puede desmontar cualquier grupo de bomba sin tener que parar el lubricador o sin que este separación afecte de alguna manera su buen funcionamiento.

5. Adaptabilidad a la fuente de fuerza motriz.

Para los lubricadores McCord de clase "SF" se han provisto diez y ocho tipos de propulsión o mando. El lubricador McCord de clase "SF" puede instalarse en cualquier punto, ya sobre la misma máquina, ya a distancia de ella, según las condiciones del trabajo que se presente.

6. Boquilla cónica para asegurar una precisa alimentación.

El tamaño de la gota de aceite que cae de la boquilla cónica de alimentación visible es alrededor de una gota de gravedad, que es la medida universal para los lubricantes. La boquilla o surtidor puede desmontarse con facilidad, permitiendo inmediato acceso a la válvula esferica de retención de la alimentación visible.

LA BOMBA DE DOSIFICACION QUIMICA McCORD DE TIPO "C"

La construcción de esta bomba McCord comprende las importantes características siguientes:

(1) La facultad de alimentar una cantidad fijada de antemano de líquido, dosificada según las necesidades del caso, durante unperíodo dado de tiempo, o una cantidad regulada de acuerdo con la velocidad de la máquina en marcha.
(2) A continuación de la precisión viene la seguridad. Todas las piezas de la bomba McCord se hacen de modo que rindan mucho tiempo de servicio práctico, lo que es un elemente esencial.
(3) El fácil desmontaje de todas las pieza de la bomba McCord permite un ajuste rápido y preciso y una limpieza completa.
(4) Todas las piezas móviles están completamente encerradas, funcionando en aceite, completamente protegidas contra el polvo, tierra y los elementos naturales.
(5) La construcción McCord asegura una alimentación positiva de líquidos, aun en presencia de presiones hasta de 2.000 libras.
(6) La superioridad técnica de la bomba McCord se pone una vez más de evidencia mediante el hecho de que el mecanismo de propulsión puede extraerse con facilidad quitando sencillamente cuatro pernos, en el caso en que se desee pasar a propulsión rotativa o de trinquete.

Cunado se emplean estas bombas para alimentar o inyectar productos químicos en los conductos de petróleo crudo, se proveen de un depósito químico auxiliar, de lámina con revestimiento de plomo, con cabida para tres galones. Este depósito se une al lado de aspiración de la bomba. Para este servicio se emplean bombas de acero. (También podemos suministrar unidades de bombas de especiales aleaciones de acero.)

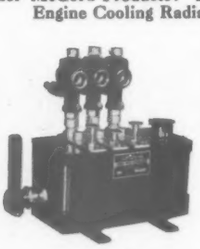
CAPACIDAD

El modelo de émbolo de ½ pulgada alimenta una pinta (como un litro) de líquido en 261 movimientos de émbolo. El modelo de ⅛ de pulgada alimenta una pinta de liquido en 464 movimientos de embolo, y el modelo de 1/16 de pulgada alimenta una pinta en 167 movimientos de émbolo. Catálogo a solicitud.

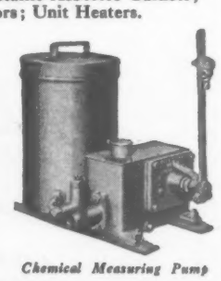
Other McCord Products: Metallic Asbestos Gaskets; Engine Cooling Radiators; Unit Heaters.

"SP" Lubricator for slush pumps

4 Feed "LD" Lubricator



"SF" Lubricator



Chemical Measuring Pump

McCORD RADIATOR & MFG. CO., DETROIT, U.S.A.

Quick Shipment "SEEP" and "STAR" Valve and Pump Cups

FOR CUPS NOTHING BEATS SELECTED LEATHER

● Oil field supply dealers carry many sizes of "Seep" and "Star" Cups and we back them up with immediate shipment of all sizes from large stocks at our plant.

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WE READ WATER

We invite correspondence from plants, in any part of the world, that have corrosion, scaling, and other water trouble. We have the specific water treatment and organic chemicals to correct each case that is now lowering efficiency in your plant. Our Export Department, working with our laboratories, will tell you how we have helped many companies in various countries.

Write today for our booklets on scale and corrosion prevention, accurate proportioning, oxygen removal and living organism control.

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Solid Woven Cotton
BELTING
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Used in all oil fields
for
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Companies, Government Give Venezuelans Full Oil Display

(Continued from Page 156)

tion of all the operations and points out the various camps and points of interest. This is done with the aid of a microphone and loud speakers and the talk is followed with much interest by the visitors.

Among the other exhibits is a separate maquette which displays a model of the new oil terminal of the Mene Grande Oil Co., Puerto la Cruz, near Guanta, terminus of the 100-mile pipe line which t ransports oil from the Oficina and other interior oil fields to the Caribbean Coast.

There are also exhibits of seismograph instruments, magnetometers, and gravity meters and a geological section where interesting slides can be examined by the visitors through microscopes. Geologists are in attendance to explain the collection of fossils that are included in the geological exhibit.

Movie Most Popular

Most popular section of the exposition, however, is the moving-picture display which is shown every hour. It shows the principal operations of the oil industry from the finding of oil to its delivery to the consumer. Geological and seismograph parties are shown operating in the field as well as drilling operations, electrical logging operations, the gathering of the oil, refining, shipping, and the delivery of finished products to the ultimate consumer. Uses of petroleum products from tractors to airplanes and from industrial plants to cooking stoves are also shown.

Much of this film was shot at the Caripito, Quiriquire and Jusepin camps of the Standard Oil Co. of Venezuela and, in addition to the abovementioned subjects, there are interesting views of these camps. These camp views show the housing facilities, schools, hospitals, commissaries, clubs, and dining halls.

Before leaving the exposition, each visitor is given a pamphlet, one for adults and another for children. These descriptive booklets tell the story of oil in Venezuela. They are prepared and distributed by the sponsors of the exhibit.

The completeness of the exhibit and the accuracy with which objects have been reproduced make the exposition an outstanding industrial show. Because of the interest which Caracas residents have shown in it, the sponsors plan to move the exposition to other important communities in Venezuela. Fulfillment of this plan however has been delayed by the continued interest shown in the capital.

●

Technical Training for Nationals Policy Venezuelan Companies

(Continued from Page 145)

ciation to which they pay monthly dues and from which they receive financial assistance for the payment of operations or other medical expenses. This plan, which is an employe effort, has been aided financially by the company.

It has always been a Standard Oil Co. policy to train nationals of the country in which it is operating. Venezuela has not been an industrial country and consequently few men skilled in the various trades were available. It was, therefore, necessary to develop a definite program of training. This program has been very effective and Venezuelan artisans have been developed in every trade incident to oil-field operation, including the highly skilled and technical job of drilling. At the present time the informal job training has been supplemented with a more comprehensive training for machinists, electricians. welders, warehousemen, marine workers, and others. The goal of this program is to make the entire personnel of the mechanical trades, including supervisors, Venezuelan.

Supervisory Conferences Instituted

In order to equip present Venezuelan supervisors better and also to make it possible to advance them to positions of greater responsibility, supervisory conferences have been instituted among some of the Venezuelan foremen. The company has also started, on a limited scale, training courses among clerical employes and, in addition, is sharing part of the financial cost for some courses pertaining to office work in recognized institutions in Caracas.

The company has instituted primary schools for children of the employes in the various isolated areas where there were no government school facilities. These schools are now required by law. At the beginning of the current school year, incidentally, 15 company schools had an enrollment of approximately 2,000 pupils. In one of the eastern Venezuelan rural schools, older boys will receive instruction in agriculture and manual training and older girls in cooking and sewing.

A policy of awarding scholarships has also been adopted by the company. There are a number of Venezuelans studying engineering and medicine and one specializing in diesel mechanics in the United States. A number of the national employes are receiving instruction at Caracas in engineering, geology, nursing, and pedagogy on company scholarships.

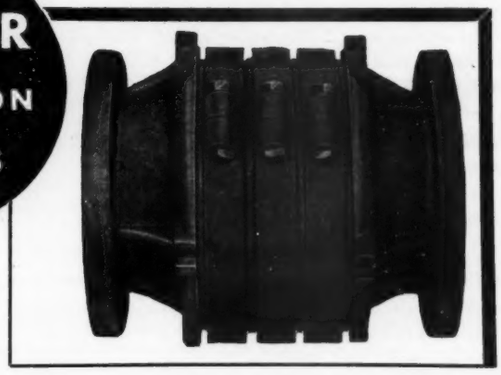
HIGH TEMPERATURES

Present the Tough Expansion Problems

LAS ALTAS TEMPERATURAS

presentan los difíciles problemas de dilatación

BADGER EXPANSION JOINTS



Stainless Steel Joints Solve Them 100%

They solve these high temperature expansion problems because the Directed Flexing stainless steel corrugations will function perfectly up to even 900°F. They solve them because stainless steel will withstand the corrosive conditions usually prevailing. They solve them because being the corrugated type, they are packless.

These are tangible, visible factors pointing to Badger Stainless Steel Expansion Joints as the best buy for process lines in refineries.

Less visible, perhaps, but fully as important is the scientific heat-treatment given every Badger Expansion Joint. This assures durability. Bulletin 100 gives complete details.

Uniones o juntas de acero inoxidable La solución de todos los problemas

Resuelven estos problemas de la dilatación provocados por las altas temperaturas a causa de que las corrugaciones de acero inoxidable de flexión dirigda funcionarán perfectamente hasta una temperatura de 900 grados F. Los resuelven porque el acero inoxidable puede resistir las condiciones corrosivas que ordinariamente predominan. Los resuelven porque siendo del tipo corrugado o acanalado, no necesitan empaquetadura.

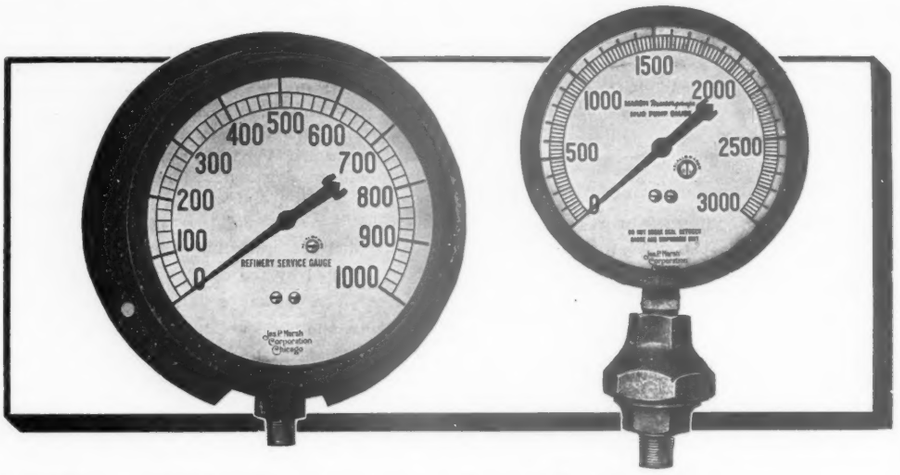
Estos son factores visibles, factores tangibles que justifican la superioridad de las uniones de dilatación Badger de acero inoxidable y su merecida fama como las mejores para la tubería de procedimientos en refinerías.

Menos visible, talvez, pero igualmente importante es el tratamiento térmico científico que se da a cada unión de dilatación Badger. Esto le asegura gran duración. En el boletín 100 damos información detallada.

E. B. BADGER & SONS CO.

75 PITTS ST., BOSTON, MASS.

Agents in Principal Cities



The Oil Industry's OWN Gauge—

THE broad line of Marsh Gauges for the petroleum industry combines remarkable stamina with the highest possible degree of accuracy. An excellent example of advanced Marsh construction is the moisture-proof, vapor-proof, dust-proof Refinery Gauge illustrated above with its sturdy "Mastergauge" movement of Monel and stainless steel. Lasting accuracy is assured by the use of a stainless steel Bourbon tube lathe-turned from solid bar stock, bored, reamed and ground to microscopic limits. Another typical Marsh development is the mud pump "Mastergauge" (illustrated at the right above) built to equally high standards and having a diaphragm of 18-8 stainless steel.

A gauge for every service

The broad Marsh line includes gauges especially designed for blenders, boilers, burners, capping, Christmas trees, columns, heaters, hydrogen units, instrument panels, piping, pumps, Reid vapor bombs, scrubbers, separators, slush pumps, stills, tanks, towers, water feeders, and all other applications in refineries, natural gasoline plants, chemical plants, and drilling units. Ask for complete details.

EL INDICADOR de la Industria del Petróleo.

LA extensa línea de Indicadores Marsh para la industria del petróleo se distingue por la admirable resistencia y el más alto grado de precisión de aquéllos. Por el Indicador para Refinerías que se ilustra arriba puede verse que la construcción de los productos Marsh es insuperable. Este Indicador es resistente a la humedad, el vapor y el polvo y tiene un fuerte mecanismo "Mastergauge" hecho de metal Monel y de acero que no se mancha. Se obtiene una precisión duradera usando un tubo Bourdon de acero que no se mancha, el cual es torneado a máquina de una barra sólida y luego taladrado, escariado y esmerilado a un tamaño microscópico. Otra construcción Marsh típica es el "Mastergauge" de bombas para lodo (ilustrado arriba, a mano derecha), construido de acuerdo con las mismas normas, el cual tiene un diafragma de acero que no se mancha, 18-8.

Indicadores para todas las industrias.

La extensa línea Marsh consiste en indicadores construidos especialmente para Mezcladores, Calderas, Quemadores, Tapas, Arboles de Navidad, Columnas, Calentadores, Unidades para hidrógeno, Tableros para Instrumentos, Tuberías, Bombas, Bombas Reid de vapor, Limpiadores, Separadores, Bombas para lodo, Alambiques, Tanques, Torres, Alimentadores de agua y para diversos usos en refinerías, instalaciones para gasolina natural, fábricas de productos químicos y unidades para taladrar. Pídanse informes completos.

MARSH GAUGES

JAS. P. MARSH CORPORATION, 2065 SOUTHPORT AVE., CHICAGO, ILL.

Have You Renewed Your Subscription? Do It Promptly

Vigorous Search for Reserves Successful in U. S. S. R.

(Continued from Page 119)

producers. Refining of the crude gives gasoline, kerosene, lubes, liquid bitumens, asphalt, roofing tar and carbolineum. The shale ash is utilized as a component of brick and cement.

The recent growth of the industry is shown by the following figures (official Soviet sources):

ESTONIAN SHALE-OIL INDUSTRY (METRIC TONS)

	1929	1937	1938	1939
Shale production	518,000	1,123,900	1,471,000	1,620,000
Crude shale oil produced	11,000	111,900	140,200	178,000
Gasoline produced	14,300	15,500	24,500	

There is also an important gas reserve on Koksher Island, near Tallin. The gas is 80 per cent methane. Production has been limited to nearby utilization requirements, but prospecting is now in progress to develop gas production in this vicinity for piping to cities. Oil indications in Esel Island are also being investigated.

New Devices and Processes

Equipment is important in considering new production possibilities. This year's most important developments in the Soviet Union along these lines are:

1. The Buzinov method of automatic, straight-line, off-plumb drilling, which was first developed in connection with the boring of escalator shafts for the Moscow subway, and has now been worked out for oil-well drilling. It shows advantages over the whipstock system, and is of especial importance in the Soviet Union in connection with the peculiar podnadvig formation at Grozny and the offshore deposits at Ilyich Bay.

2. Several types of rodless deep-well pumps, including an electrical model, a hydraulic model, and a "magnetifugal" model (this philological innovation is obviously constructed on the model of centrifugal; it designates a device which delivers a reverse-progressive action to the pumping mechanism, instead of rotation. Rodless pumps have not heretofore been made in the Soviet Union.

3. A hydroelectric drill, combining a rotational grinding with a percussive action, very efficient for slim-hole and core drilling.

4. A highly sensitive electro-differential control device at the well head which automatically (and almost instantaneously) regulates the drilling regime at the bit in accordance with the varying hardness of the formations encountered on the way down.

5. The new turbodrill and electrodrill for full-scale all-depth drilling which, according to the more enthusiastic Soviet writers on this subject, bid fair to render the conventional rotary system obsolete.

In the realm of pure physics, some interesting developments are reported at the Baku branch of the Academy of Sciences, where Prof. Y. Dorfman and his associates in the physics section have specialized in oil-field problems. Professor Dorfman reports that the following new aids to oil-field exploitation are now ready for industrial application:

1. Electrical models of new fields, in which graphite powder represents the productive sands and movable iron rods and rails represent the wells and productive contours, and in which an intricate system of controls is used to vary the flow of electrical currents (representing oil potential) through the individual wells and through the field as a whole. Given regular reports of bottom-hole pressure and daily production for each well in a new field, the model will provide information, according to the report, permitting progressively more accurate placing of new wells from the point of view of optimum production with the lowest number of wells.

2. A new instrument applying the Wheatstone bridge principle to the determination of porosity in laboratory samples, which reduces each measurement to a matter of minutes instead of the several hours required by existing methods, and eliminates the necessity of constant temperature control. This is fully developed and the new device is being manufactured for use in industry.

3. Thermal logging. Electrical logging is unsatisfactory when the casing is down because the current is dispersed along the pipe due to the low conductivity of the surrounding rock. An apparatus has been designed, based on the suggestion that the difference in thermal conductivity between the casing and the surrounding formations is much less than the difference in electrical conductivity. This has given satisfactory results in large laboratory well models and in experimental field trials, and a perfected method of thermal logging, based on these field trials, is being worked out for the oil industry.

Gas survey (subsoil air analysis) as a prospecting aid is also receiving new impetus this year in the Soviet Union. This branch of geochemistry has been somewhat neglected of late; in fact, Professor Sokolov, who pioneered in this method, had occasion recently to complain that gas survey has received more development in the United States than in the country which gave it birth, and he adduces data from The Oil and Gas Journal to prove it.

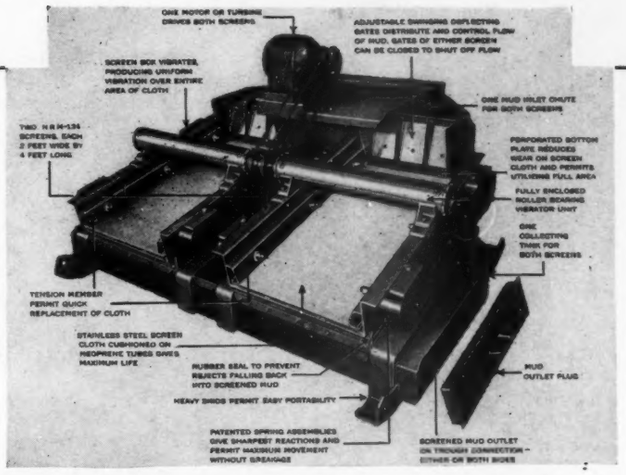
Soviet Industrialization

The well-publicized difficulties attending the industrialization of the Soviet Union are still in evidence. The truism may bear repeating, that the heroic task of raising the technological culture of an agrarian population to fit the requirements of an advanced industrial economy on the scale and at the rate which have been accomplished in the Soviet Union, is bound to encounter difficulties, especially when the process is complicated by a serious drain on industrial resources due to defense needs in an international situation fraught with "dangerous surprises." The oil industry has its share of difficulties—the shortage of skilled manpower, the lag between laboratory advances in the art and industrial exploitation of such advances, the lag between the rapid introduction of precision machines and instrumental control technique on the one hand, and the somewhat slower advance of average human ability to cope with them on the other, etc.

Administrative measures adopted this year to deal with these general problems include: (1) The decree of June 26 increasing the working day to 8 hours instead of 7, and the work week to 6 days instead of 5, and establishing juridical penalties for persistent unjustified absences or lateness in reporting to work; (2) the decree of July 10 establishing a system of verification and responsibility for the quality of output in accordance with official standards; (3) the creation of a new commissariat (cabinet department) on September 7—the People's Commissariat of State Control—to exercise strict control over expenditures and accounting in industry, and to institute a centralized government supervision of the fulfillment of government decrees in industry.

Following these measures oil-industry reports in the third quarter of the year noted good progress in clearing away bottlenecks and increasing output, while drawing attention to other situations which need immediate attention.

In the meantime, for the accomplishment of its planned program of 54,000,000 tons of annual crude-oil production by the end of the third 5-year plan (1942), the oil industry badly needs more high-pressure pumps than are being made, better drill pipe and bits, many more portable and semiportable drilling rigs, heavy-duty drill collars, swivels, crown blocks, etc., prime movers, compressors, breather installations, spherical tanks and gas equipment in general.


ONE MOTOR OR TURBINE DRIVES BOTH SCREENS
ADJUSTABLE SWINGING DEFLECTING GATES DISTRIBUTE AND CONTROL FLOW OF MUD. GATES OF EITHER SCREEN CAN BE CLOSED TO SHUT OFF FLOW
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● Link-Belt pioneered the vibrating screen for reconditioning rotary drilling mud, and Link-Belt has offered continuous screen improvements as drilling methods progressed. For this reason operators the world over look to Link-Belt for new screening features, improved screening designs. Link-Belt's new, small dual screen unit, shown and described above, is the most practical and economical means of keeping drilling mud free of costly abrasive materials. Complete details and prices on the NRM-124 dual hook-up will be sent you upon request. Write now for fully illustrated Folder OG-1872-A.

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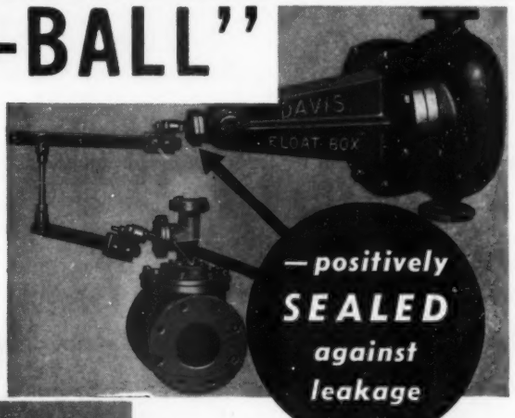

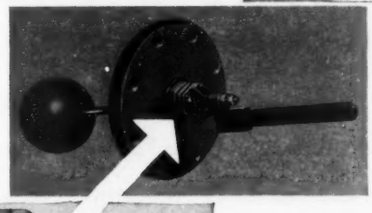

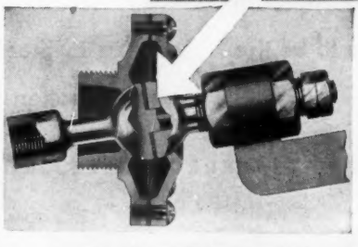

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QUESTIONS ON TECHNOLOGY

By W. L. NELSON, TECHNICAL EDITOR

W. L. NELSON

This department of The Oil and Gas Journal is devoted to the manufacturing branches of the oil industry.

Those connected with the refining of crude petroleum, the manufacture of natural gasoline and closely allied industries are invited to submit their problems to W. L. Nelson, technical editor. The department was created for the purpose of aiding managers, superintendents, engineers, chemists, and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products.

Questions should be submitted in as much detail as possible. Inquiries must be signed but only the given initials will be printed. The source of the question is considered to be confidential.

Questions requiring a discussion of patents, extended computations, or a detailed study cannot be considered. When the matter is of general interest, a reply will be published within a reasonable time.

Test for Stability of Kerosene

In the storage of kerosene over summer, what would be a good test to check the susceptibility of the product to change color—that is from water white to an off color?—W. F.

The types of color instability of kerosene may be classified as follows:

1. A gradual brownish coloration due to age and light.
2. Clear light yellow which appears even if stored in the dark and is caused by oxidation of materials such as unsaturated naphthenic acids.
3. Discoloration due to the presence of cracked materials.
4. Yellowish discoloration due to the oxidation of amino bodies.

Types 2 and 4 are bleached by exposure to sunlight.

The color instability of kerosene is not completely understood and hence it is necessary to test the material by several methods including exposure to sunlight. The two main tests are:

Hillman test.—The kerosene is filtered through a Whatman No. 12 filter paper. The contents (1 g.) of one capsule of standard lead peroxide is placed in a 2-l. beaker (diameter 11 cm.) with 20 ml. of 0.175 N. caustic soda solution. The beaker is thoroughly but carefully rotated until all the lead peroxide is dispursed in the solution. Great care should be taken so that no lead peroxide adheres to the beaker and that no lumps of lead peroxide are wetted on the outside only. Seven hundred milliliters of kerosene warmed to 30° C. are added to the lead peroxide and placed under a stirrer; the stirrer adjusted so that the agitator is about 0.5 cm. from the bottom of the beaker. The kerosene is agitated for 60 seconds (stop watch), allowed to settle for 5 minutes and filtered through a Whatman No. 12 filter paper. The procedure must be carried out in the dark. Refilter if necessary.

A similar test but employing alkaline potassium ferricyanide in place of alkaline lead peroxide is said to indicate the same type of instability.

Dr. Moser's silico-tungstic acid test for nitrogen compounds.—Fifty grams of silicic acid are dissolved in a solution of 12 g. of sodium hydroxide in 50 ml. of water diluted to 200 ml., heated to boiling, and the silicic acid precipitated with hydrochloric acid. The deposit is collected on linen by suction and washed with hot water. The silicic acid is then added to a boiling solution of 50 g. of sodium tungstate in 200 ml. of water and neutralized by 80 ml. of 2 N. sulfuric acid. The mixture is boiled until a filtered sample, when acidified with hydrochloric acid, does not show any yellow deposit of tungstic acid. During boiling, as soon as the solution becomes alkaline, 2 N. sulfuric acid is added (about 20 ml.) and the loss by evaporation is replaced. After filtration the solution is ready for use.

Five hundred milliliters of the oil is shaken with 25 ml. of 30 per cent sulfuric acid in a separatory funnel to extract the nitrogen bases. The acid extract, which in the presence of nitrogen is a reddish and yellowish color, is drawn off and a portion treated with the silico-tungstic acid drop by drop as long as any precipitation occurs. The precipitate generally has a white to reddish color. Test is negative if there is little or no discoloration.

Negative results by these tests are somewhat inconclusive but a positive result (distinct discoloration) is definite proof of instability.

A kerosene which is in any way unstable must be handled with extreme care. Contact with metals, particularly copper or copper-base alloys (as in many pumps) or minute traces of alkalies (cleaning materials) may cause discoloration of kerosene.

Simplified Flow Diagrams

Treating Foul-Smelling Natural Gasoline

Are there any chemicals through which mercaptan gas could be passed that would neutralize them and destroy their odor? Also whether it would be practical to place in operation with a mercaptan removal plant treating 1,600 bbl. of gasoline per day?—A. A. M.

Any of the processes referred to as sweetening processes are satisfactory for the removal (or conversion) of mercaptans. Among these are the doctor, hypochlorite, copper, and solutizer processes. For gasolines that are scarcely "sour," a wash with caustic solution may even suffice. The fact that gasoline plants are usually situated in a somewhat remote vicinity has led to the adoption of the more simple types of plants such as the caustic-wash, hypochlorite, or (solid) copper processes. For low-sulfur gasolines the caustic-wash process is by far the cheapest process to operate, and in general the cost of operating the solid copper chloride process is less than the cost of the hypochlorite process.

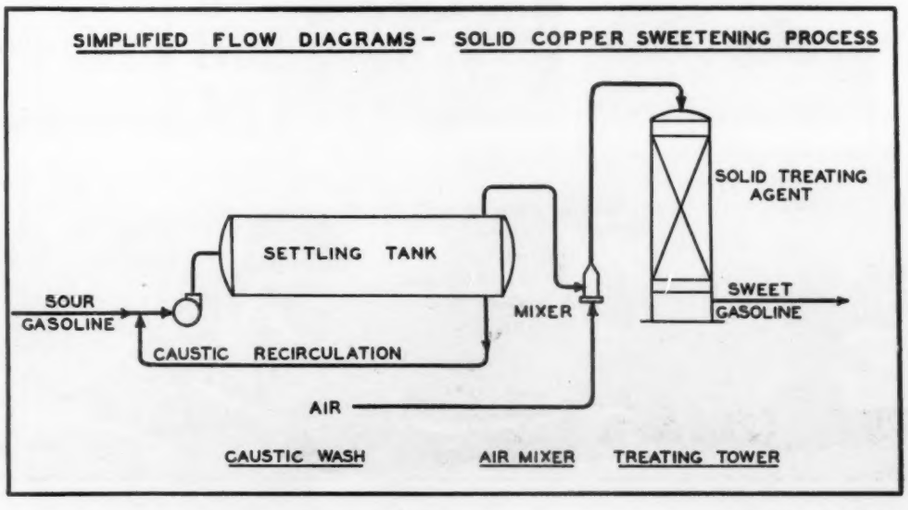
All of these processes cannot be discussed here (nor can flow diagrams be presented) but one process, i.e., the solid copper chloride process will be pictured and discussed, and the other processes can be examined in the following references:

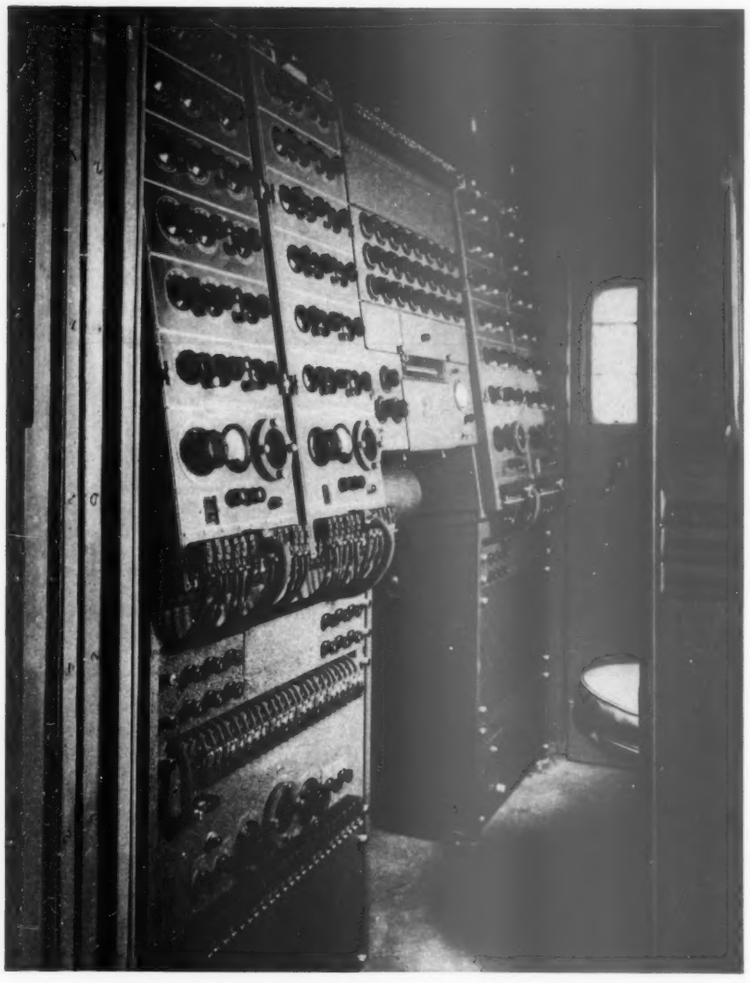
Caustic wash—C. M. Ridgway, The Oil and Gas Journal, March 31, 1938, Page 83.

Hypochlorite—Anon., Refiner & Nat. Gaso. Mfr., July 1933, Page 278.

The solid copper chloride process involves simply the contacting of the gasoline with caustic solution for removal of hydrogen sulfide, and contacting with a bed of clay which has copper chloride suspended upon it. A flow diagram is shown on this page. The mercaptan hydrocarbons are converted into disulfides which dissolve in the gasoline but are not noxious or corrosive. The copper chloride is changed from the cupric to the cuprous state by this reaction but it is currently revived to the cupric state by air which is introduced in small amount into the incoming gasoline. The chemical is not consumed in the operation but after several years of operation, it may be necessary to install a new batch of treating agent.

The cost of installation may not exceed $2 per barrel of daily capacity, and the operating cost ranges from 0.5 to 0.7 cent per barrel.





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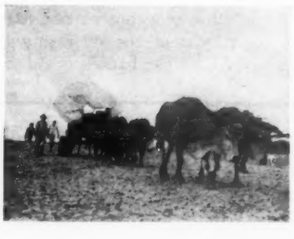

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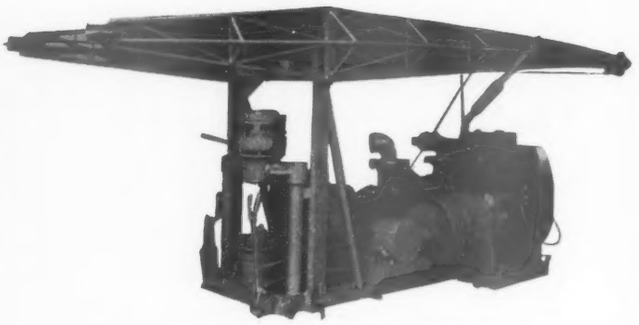

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Pipe-Line Activity

Natural Gas Pipeline Co. Plans 394-Mile Project

Plans are being made to enlarge the capacity of the main trunk line transmission system of Natural Gas Pipeline Co. of America between the Texas Panhandle and Chicago by the construction of five loops which will consist of a total of 394 miles of 26-in. pipe, not including the pipe to be laid for multiple lines at 20 river crossings. Contracts will be let for construction of these five loops in four contracts. Contracts will be let for river crossings separately. This program calls for construction work in Texas, Kansas, Nebraska, and Iowa. The program has been planned so that it may progress from the western end northeastward.

Between compressor Station 1 at Fritch, Tex., and the general vicinity of Station 3, two loops will be built with a total of 121 miles. Specifications will be issued January 30; bids are called for February 15 and it is expected that the contract will be let shortly afterward. Specifications for the next job will be issued February 15 and bids will be in February 28; this consists of 99 miles in the section of the line in the vicinity of compressor Station 5. On March 3 specifications will be issued for the preparation of bids which are to be in March 17 for 96 miles in the vicinity of compressor Station 7 near Omaha, Neb. In March specification are to be issued for 78 miles in the vicinity of compressor Station 9 in Iowa; bids for this loop are to be submitted early in April.

Sinclair and Stanolind Projects Wait for Government Action

Sinclair Refining Co., pipe-line department, and Stanolind Pipe Line Co. have received bids for the taking up and relaying of multiple crude-oil pipe lines in the vicinity of a plant which the United States Government is constructing near Wilmington, Ill., for the manufacture of TNT. The work required involves approximately 15 miles of right-of-way of each of these two companies.

The letting of contracts for this work has been held up by both companies until the Government takes action to make provision for the expense of this undertaking. Because of the laying and relaying of multiple lines involved in these projects the work amounts to a total of about 180 miles of line on 60 miles of right-of-way. Additional work may be undertaken to move the lines of a third pipe line.

Standard of Indiana Prepares For Gasoline-Line Operation

In connection with the promotion of Fred E. Wood, petroleum engineer, to the position of assistant to A. W. Peake, vice president of Standard Oil Co. of Indiana and president of Stanolind Pipe Line Co., it has been announced that among his other duties Mr. Wood will be especially concerned with the gasoline and refined products pipe-line projects which the Standard Oil Co. of Indiana contemplates constructing in middle western states.

J. C. Dowding Has Contract for Consumers Line in Michigan

MOUNT PLEASANT, Mich.—Construction work of 21 miles of 12¾-in. pipe from Dice's Corners, west of Midland, Mich., to the Wise field compressor station has been undertaken by J. C. Dowding, general contractor of Flint, Mich., for Consumers Power Co. This project represents the first section of a natural-gas transmission line, which is planned for the purpose of providing an outlet for the Wise-Isabella, Marion-Osceola, and Riverside-Missaukee gas fields.

Eastern Pipe-Line Runs Decline in November

NEW YORK.—A total of 16,526,000 bbl. of crude oil were carried by eight eastern pipe lines in November, against 17,859,000 in October and 16,272,000 in the 1939 month, it has been reported. For the first 11 months of 1940, the total was 206,326,000 bbl., against 146,115,000 in the like 1939 period. The reduction in November from the preceding month was accounted for largely by the decline in crude-oil production in the Illinois field.

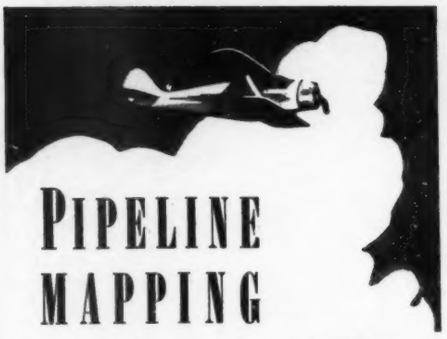
Only one line, the Buckeye, showed an increase in deliveries in November over the 1939 month, seven reported decreases, while Southern Pipe Line Co. reported no deliveries for the second consecutive month.

Standard of Louisiana Plans Line Across the Red River

SHREVEPORT, La.—Standard Oil Co. of Louisiana has submitted an application to the War Department asking permission to construct an 8-in. pipe line and submarine cable across the bed of Red River at Alexandria, La. The new line will be laid from the company's North Louisiana to Baton Rouge trunk line, to the Olla field, La Salle Parish, Louisiana.

Lone Star Arranges for Loan In New York and Pittsburgh

NEW YORK.—It was reported late last week the Lone Star Gas Corp. was arranging a loan with a group of New York and Pittsburgh banks to refund its $20,000,000 convertible 3½ per cent bonds and bank-held notes amounting to $6,000,000. Terms of the new financing were not revealed, but it was believed the corporation would get a rate of around 2 per cent.



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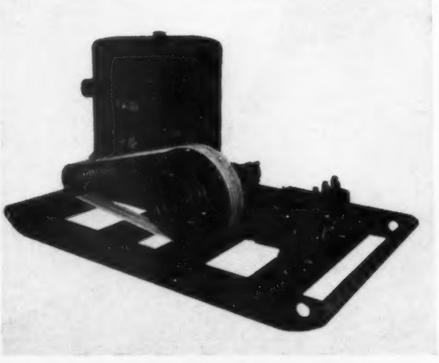

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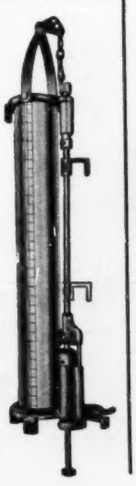

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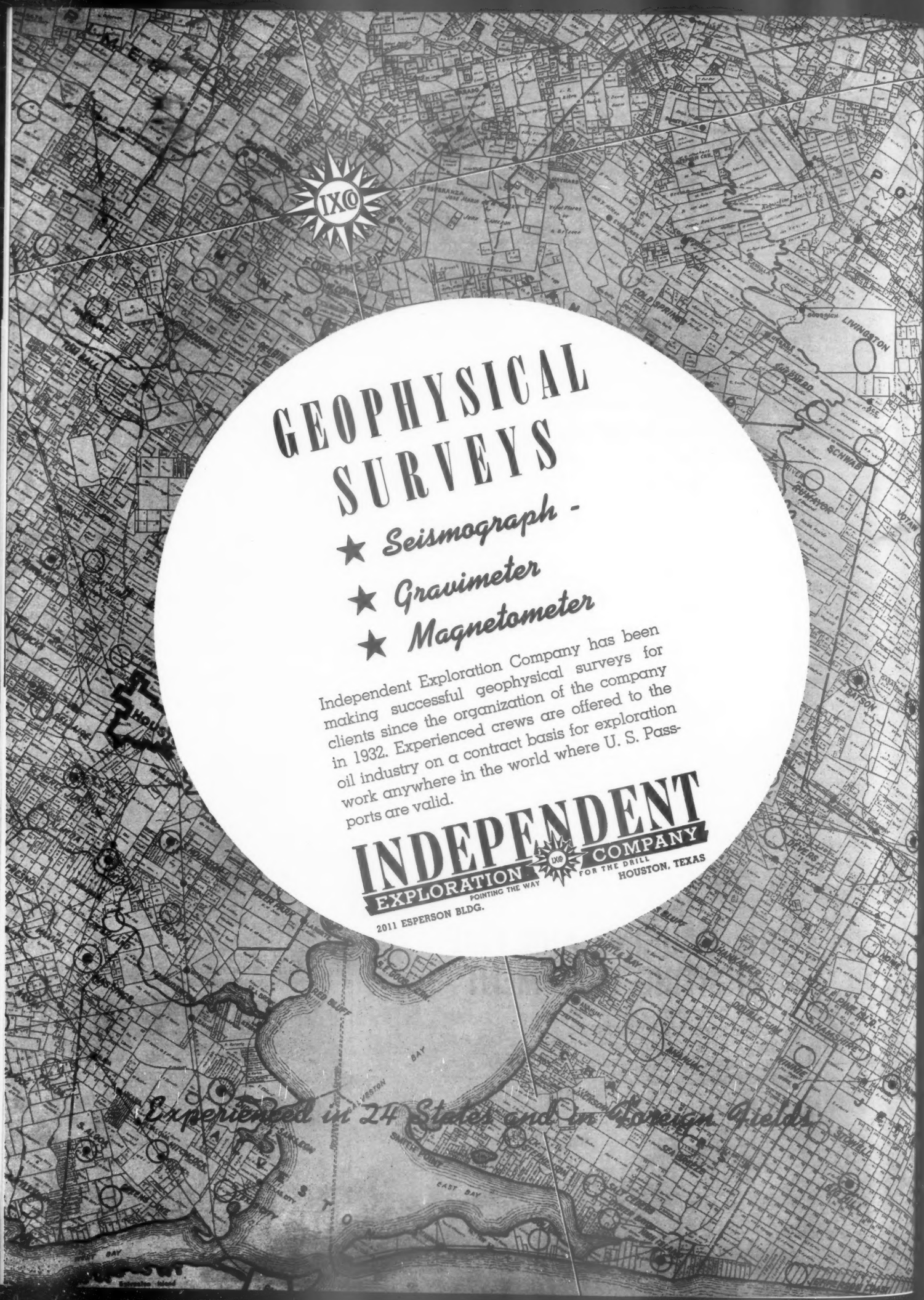
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FIELD DEVELOPMENTS...

HIGHLIGHTS FROM THE WEEK'S NEWS—

Completions for the week showed a small decrease, with 519 wells as against 529. Dry holes were off 20, while gas wells and oil wells were up 7 and 3, respectively. A significant decline was registered in Illinois where producers dropped from 46 to 29 and dry holes from 30 to 15. With the exception of a number of small fields to be drilled up in White County, activity is shifting to the northern sector with Jasper County in the lead.

As the year approaches a close, Kansas operators continue to pave the way for active development. As has been pointed out before, development in western Kansas consists mainly of pushing forward along the Barton arch and also in picking up scattered spots on what later develop into northeast-southwest cross trends. At the same time, drilling creeps down the norheast flank of the arch. At the present time wildcatting has shown favorable results in all three directions and the new shows cover a sufficiently extensive area to promise that 1941 will be a very active year in this region.

Two plays, one a year old and the other just starting, will give Texans some cause for continued worry about allowables. The Fort Worth basin play continues to mark up successes, almost weekly, and the Woodbine play in Wood County threatens to assume major importance. This week, the second test found the pay 369 ft. higher than the discovery and is showing for a gas well. Numerous tests are going down rapidly and, already, operators are talking of another Van. There will be one difference, however, unless something is done rapidly. Van is operated under unit control and, consequently, development was carried on in an orderly fashion. The Hawkins play shows more signs of developing in the manner of East Texas than of Van, although quantitatively it does not show signs of approaching the former pool in importance.

EAST TEXAS: The Woodbine sand play in Wood County assumed major proportions as J. Rotondi's test 2½ miles to the north of the Manziel discovery logged the Woodbine 369 ft. higher than the discovery. The wildcat drilled 90 ft. of gas sand and was shut in. Production from the deep Travis Peak formation was indicated at two spots in Limestone County (p. 305).

KANSAS: The Ray pool in Phillips County has been extended ½ mile north and a test in Rush County reports a show in the Reagan sand (p. 291).

CALIFORNIA: California operators face curtailed production as a result of cutting off exports to Japan and British Columbia. The gradual acquisition of leases in Elk Hills by the Navy is speeding up Richfield's drilling campaign in Tupman so as to maintain the company's reserves. Standard is also drilling at Elk Hills to establish production. A wildcat in the Huasna district of San Luis Obispo County is showing oil (p. 300).

WEST VIRGINIA: Deep drilling records for this state have been broken as a Harrison County test reaches 9,450 ft. The Ravenswood test which brought in either a new pool or an extension to the Oriskany gas field tested 6,000,000 cu. ft. after a shot. Other tests are under way with a view to further extending the limits of this field which is the most important active area in the eastern fields (p. 303).

LA-ARK-TEX: A north outpost to the Lisbon field, after failing to confirm shows found in other wells in the Cotton Valley formation, hit the top of the Smackover lime at 10,270 ft. and found gas in an oolitic member near the top. After many weeks of comparative inactivity, Arkansas came into the news with a blowout from the Blossom sand in Union County and a northeast extension to the McKamie pool in the Smackover lime (p. 296).

TEXAS GULF COAST: Gas and distillate production were extended about 1 mile west in the Chocolate Bayou pool, Brazoria County, and a new sand was found in the Ogburn field in the same county. The east side of the West Ranch field in Jackson County will probably see increased activity following good results in a test in the 5,400-ft. sand (p. 301).

WEST TEXAS: A new field is in the making as the result of a Stanolind test north of the North Cowden pool and just south of the Andrews County line. A 7,700-bbl. well extended the Gulf Waddell pool in Crane County ¼ mile east. A well, 2½ miles west of the Duggan area in the Slaughter field, is showing oil and is testing (p. 291).

LOUISIANA GULF COAST: Gulf's West Bay test appears to have opened up a field of major proportions as it logged five sands in addition to the one which flowed 732 bbl. on test. The Wilcox trend play has extended to Pine Prairie where there is an active lease play. Blowouts in East Lake Borgne, St. Bernard Parish, and 2 miles south of Paradis, St. Charles Parish, may indicate important discoveries. On the other side of the picture, Humble's South Crowley discovery well has gone to about 95 per cent salt water and may be abandoned (p. 297).

OKLAHOMA: A third sand, the Cromwell, has been opened up in the Okemah area of Okfuskee County (p. 296).

NORTH CENTRAL TEXAS: Continental's test 7 miles southwest of Jacksboro has found saturation in both the Mississippian and Ellenburger limes. A 45-bbl. well in the Cooke sand at 6805 ft. is starting Throckmorton County off on a leasing and drilling play (p. 288).

SOUTHWEST TEXAS: Outposts have extended the East Premont pool, Jim Wells County, and the Luby field, Nueces County, approximately 1 mile. Activity in the Agua Dulce area continues with two producers coming in (p. 297).

ILLINOIS: During a week in which completions were sharply reduced, the outstanding development was a 1,323-bbl. well in the McClosky midway between the West Liberty and Dundas pools in Jasper County (p. 294).

COMPLETIONS IN ALL FIELDS . . .

(Week ended December 21, 1940)

	Oil	Gas	Dry	Total	1940 total comp. to date	1939 total comp. to date
N. Y., Pa., and W. Va.	71	27	8	106	5,761	3,548
Ohio	6	12	10	28	1,209	877
Indiana	4	3	6	13	489	350
Kentucky	5	14	11	30	526	707
Illinois	29	0	15	44	3,705	3,581
Michigan	9	0	7	16	1,127	1,444
Kansas	22	0	5	27	1,742	1,351
Oklahoma	16	1	5	22	1,732	1,702
Texas:						
North Central Texas	35	1	21	57	2,781	2,445
West Texas	31	0	3	34	1,767	1,821
Texas Panhandle	11	0	0	11	561	445
Eastern Texas	10	2	2	14	624	679
Gulf Coast Texas	18	0	1	19	1,195	1,329
Southwest Texas	19	0	9	28	2,028	2,383
Total Texas	124	3	36	163	8,956	9,102
North Louisiana	12	0	4	16	664	531
Louisiana Gulf Coast	13	0	7	20	992	742
Total Louisiana	25	0	11	36	1,654	1,273
Arkansas	0	0	0	0	178	241
Montana	3	0	3	6	233	170
Wyoming	1	0	1	2	162	141
Colorado	0	0	0	0	18	20
New Mexico	8	0	2	10	521	572
California	11	0	2	13	984	916
Miscellaneous	1	0	2	3	232	64
Total United States	335	60	124	519	29,229	26,059
Total previous week	332	53	144	529		
Week ended Dec. 23, 1939	414	44	113	571		

FIELD REPORTS

Because of the holiday season, drilling reports and tables showing average daily production are omitted from this week's issue. Publication of this material will be resumed in the issue of January 2, 1941.

Mississippian-Ellenburger Discovery in Jack County

By R. MARNE SANFORD

WICHITA FALLS, Tex., Dec. 23.—The Fort Worth basin play was further augmented last week when a deep well in south central Jack County reported flows of oil from the lower part of the Mississippian and the upper part of the Ellenburger sections.

The test is Continental 1 Robertson, M. J. Swan Survey, about 7 miles southwest of Jacksboro. It has been in the testing stages for several weeks, however, no sustained flows had been obtained. Early in the week the pay section from 5,343 to 5,386 ft. was acidized with 1,000 gal. and responded with a flow of 50 bbl. of oil in 12 hours, after oil load had been recovered. Previous to treatment the well had made a total of 103 bbl. in 24 hours through various chokes. Further testing was underway at the close of the week.

The Mississippian section was topped at 5,307 ft. and saturation was found at 5,340 ft. At 5,370 ft. the Ellenburger section was encountered, saturated to a depth of 5,386 ft., giving the well a total pay section of 46 ft., both in the lower Mississippian and upper Ellenburger. Casing is cemented at 5,343 ft. and the total depth is 5,386 ft.

Despite the fact the well is considerably west of the center of the Fort Worth basin, it nevertheless enhances the possibilities of another pay zone for future tests in the southern part of the basin. The Mississippian lime has been found at several points in the northern part of the basin, but to date has been lacking in the geological sections of wells in the southern part of the basin. Several tests in Young County have produced some oil from the detrital zone at the contact of the two age rocks, however, the new Jack County strike reported very little detritus material at the contact zone. Rather there was only a few feet showing some fractures and breaks but no actual detritus.

SUMMARY OF COMPLETIONS

North Texas

	No.	Bbl.	Footage
Oil wells: Hull-Silk field	4	2,354	12,992
Thornberry field	3	35	3,417
Walnut Bend	2	976	9,676
Montague field	2	18	1,710
K.M.A. field	4	1,248	13,080
Semiwildcats	2	103	8,212
Wilbarger field	2	92	5,465
Other fields	11	3,549	24,485
Dry holes: Wildcats	4	.....	7,316
K.M.A.	2	.....	7,907
Other fields	9	.....	12,899
Gas wells: Wildcat	1	.....	382
Total	46	.....	107,541

West Central Texas

	No.	Bbl.	Footage
Oil wells: Fields	5	698	10,875
Dry holes: fields	3	.....	3,480
Wildcats	3	.....	8,052
Total	11	.....	22,407

Possible Archer County Strike

About 5 miles north of the town of Scotland in eastern Archer County, the Southern Petroleum Exploration 1-A L. F. Wilson, Lot 4, Block 73, A.T.N. C.L. Survey, was indicating the opening of a new deep-lime field at the close of the past week. Saturation was found from 5,200-15 ft. and the hole filled 2,700 ft. with oil in 48 hours. Tubing was being run for acid treatment early the coming week.

Failure was recorded for a closely watched wildcat in the eastern part of Archer County. It was Adams Oil & Gas 1 J. H. Turbeville, Block 49, Jefferson County School Lands, about 4 miles east of Anarene. It was quit after a 1,500-gal. acid treatment brought only salt water at a total depth of 5,177 ft. in the Caddo lime. The possible pay section had been from 4,710-38 ft. and was treated through perforations in casing set at total depth.

NORTH TEXAS COMPLETIONS

Archer County

Hull-Silk field: Alexander 5 White, 8 bbl., pumping, natural, 315-27 ft. and 461-70 ft.
Dillard, White & Duncan 14 Nichols, 37 bbl. an hour, open tubing, 210-qt. shot, 3,260-4,400 ft.
Burns 2 Gray & Thweatt, dry at 4,424 ft.
Ligon 5 Moss A, 42 bbl. in 2 hr., ¾-in. choke, natural, 4,261-92 ft.
R. C. Lipscomb 6 Wilson, 954 bbl., 3,797-3,830 ft.
Anarene field: Young & Woody 1 Meade, 80 bbl., 954-58 ft.
South Mankins field: British American 3 Parkey, 85 bbl. in 2 hr., open tubing, 5,000 gal. acid, 4,630-53 ft. and 4,764-85 ft.
Griffin field: Kadane 1 Griffin, 344 bbl. in 8 hr., natural, 4,338-51 ft.
Wildcat: E. C. Harlin 1 Baker, Sec. 22, Blk. 5, Clark & Plumb Sub., top Gunsight lime 1,101 ft., dry at 1,169 ft.
Archer field: George Kesterson 2 Herron, dry at 920 ft.

Clay County

Wildcat: George G. Folden 1 Texas Joint St. Bk., Sec. 9, Thornberry Sub. 50,000 cu. ft. gas, 361-69 ft. and 371-82 ft.
Thornberry field: Johnson & Kouri 3 Taylor, 10 bbl., 1,115-30 ft.
Ted Norwood 1 Gregor, dry at 1,351 ft.
C. Y. Gorman 14 Taylor, 10 bbl., pumping, 1,117-39 ft.
C. Y. Gorman 15 Taylor, 15 bbl., pumping, 1,128-48 ft.
Halsell field: Bridwell Oil 3 Halsell, 58 bbl. in 8 hr., 4,703-25 ft.

Cooke County

Walnut Bend field: Sinclair Prairie 3 Ramsey, 97 bbl. in 3 hr., open tubing, 4,733-57 ft.
Sun Oil 8 Snuggs, 200 bbl., open tubing, 4,890-4,919 ft.
Muenster field: S. H. Walton 1 Kessler, 20 bbl., 1,285-1,385 ft.
Voth field: Harvey Drilling Co. 1 Voth, dry at 1,377 ft.
Whitfield, Pearson & Grimes 3 Sicking, 83 bbl., in 8 hr., 1,249-75 ft.
Cooke field: Bridwell 10 Flusche, 65 bbl., pumping, 800-809 ft.
Wildcat: Dick Eubanks 1 Sam Seagraves, O. M. Gray Sur., Abst. 415, dry at 2,140 ft.

Montague County

Montague field: Claymont Oil 5 Bouldin, 10 bbl., pumping, 15-qt. shot, 802-816 ft.
Falls Ref. 8 Maddox, 8 bbl. oil and 16 bbl. water, pumping, 860-894 ft.
Benton & Holmes field: L. S. Flannery 2 First Natl. Bank, 105 bbl., in 3 hr., ¾-in. choke, perf. 3,805-13 ft.

Wichita County

K.M.A. field: Coppack & Coleman 1 Warren, 25 bbl. oil and 3 bbl. water, pumping, natural, 1,504-08 ft.
Lewis Prod. 9 Wichita Natl. Bk., 63 bbl., pumping, natural, 3,765-69 ft. and 3,770-96 ft.
Hammon, Hanlon & Buchanan 34 Fassett & Tuttle, 580 bbl., 3,895-3,965 ft.
A. R. Dillard 1 Kemp & Kempner, slight show oil 3,895-3,907 ft., shot 180 qt., dry at 3,907 ft.
J. E. Farrell 3 Bradley, top lime 3,777 ft., dry at 4,000 ft.
Shell & Phillips 16 Griffin, 145 bbl., in 6 hr., ¾-in. choke, 85-qt. shot, 3,782-3,811 ft.
Electra field: J. E. Farrell 49 Waggoner, 9 bbl., 792-800 ft.
Wichita field: Winfrey 1 Davis, dry at 800 ft.
Magnolia 161 Reiley, salt water 1,365-86 ft., dry at 1,386 ft.
Hall-Jordan Oil 4 Warren, slight show oil 960-67 ft., and 1,280-87 ft., junked 1,689 ft.
H. G. Gay 1 Kackson, dry at 659 ft.
Wolfe & Hull 3 Daume, 20 bbl., 693-708 ft.
L. T. Burns 1 Robinson, slight show oil 1,670-77 ft., dry 1,930 ft.
Wildcats: Hanlon-Buchanan 1 Burnett A, 30 bbl., pumping, 120-qt. shot, and 3,500 gal. acid, 4,130-62 ft., location Sec. 34, H.&G.N. Sur., Abst. 435.
Dorian & Barnes 1 Barnes, 73 bbl., pumping, shot 120 qt., 4,008-50 ft., location Sec. 10, Blk. 7, H.& T.C. Sur.

Wilbarger County

Wilbarger field: Christie-Hickman Drlg. Co. 1 Waggoner, 22 bbl., pumping, natural, 1,909-11 ft.
Davis 6 Waggoner-Smith, 70 bbl., 1,000 gal. acid, 3,538-54 ft.
Wildcats: C. M. Barnes 1 Clarida, Sec. 95, Blk. 14, H.&T.C. Sur., dry at 3,005 ft.

Young County

Wildcat: A. Kriss 1 Willard, Sec. 224, T.E.&L. Sur., dry at 1,002 ft.
Young field: Hazel B. Sparks 3 Clark, 40 bbl., pumping, 865-876 ft.
Larsen 1 Kirkland, dry at 715 ft.
Markely field: Dublin 1 Edwards, dry at 955 ft.

WEST CENTRAL TEXAS

FORT WORTH, Tex., Dec. 23.—Southern Jones County's new Flippen sand field was assured at the close of the past week as the plug was drilled from casing and an additional 2 ft. of pay was drilled. The discovery is Danciger 1 F. B. Kelso, Lot 82, Godwin subdivision, De Witt County School Lands, about 2½ miles west of the Akard field in the extreme southern part of Jones County.

No. 1 Kelso drilled plug at 2,339 ft. and after standing for 12 hours fluid had risen 1,700 ft. in the hole. The hole was swabbed down to within 200 ft. of bottom and an additional 1 ft. of pay drilled, after which the fluid rose 300 ft. in about 2 hours. Another foot of pay was drilled and the test was shut in for further testing the coming week. Top of the pay was encountered at 2,335 ft. and was bottomed at 2,341 ft. total depth.

The second producer from the lower King sand pay in the Triplett field of Jones County was indicated at the T. D. Humphrey 2 Triplett, in the J. S. Hughes Survey. The test was originally completed from the 2,150-ft. Cooke sand and was deepened to the King sand after this level was opened by the operator's 3 Triplett in October. No. 3 is a location west of 1 Triplett. The new King sand pay is at 2,380 ft. and 2 Triplett will be drilled in early the coming week. Two and a half miles to the northwest the operator is preparing to spud a second wildcat in Section 18, Block 15, T.&P. Survey. It is ½ mile south of the 2,751-ft. failure recently quit on the Lipman lands.

Throckmorton County

A drilling program has been launched for southern Throckmorton County and surrounding a shallow discovery brought in the past week by Jack Bell on the Howsley-McCord lands. The discovery well, located in the W½ Section 28, in the southeastern part of the Comanche Indian Reserve, rated 45 bbl. daily from the Cooke sand from 680-95 ft. Combined Oil Co. and the Owenwood Oil Co. have announced intentions of drilling several tests in their blocks surrounding the shallow discovery. The two oil companies and Jack Bell all own considerable acreage in the area, the oil companies having contributed an 80-acre lease toward the drilling of a deep 4,500-ft. test which Jack Bell started last week in the east end of Section 25, about ½ mile west of the shallow discovery.

WEST CENTRAL TEXAS COMPLETIONS

Jones County

Olson field: King Oil 1 Almquist, top Palo Pinto 3,226 ft., 70 bbl., pumping, 3,236-40 ft.
Lewis field: Pet. Prod. 4 Bryant-Link, 348 bbl., 3,000 gal. acid, 1,859-68 ft.

Palo Pinto County

Semiwildcat: Hickok & Reynolds 2 Gauldin, NE NE NE Sec. 1,740, T.E.&L. Sur., show oil 4,690-4,708 ft., est. 5,000,000 cu. ft. gas, 4,520-25 ft., dry at 5,250 ft.
Strawn field: Palo Pinto Oil & Gas 6 Marion, 160 bbl., pumping, natural, 2,996-97 ft.

San Saba County

Wildcat: Three Widows Oil 1 Ballard, NW cor. S½ Sec. 80, H. Behrenroth Sur. 506, top saline 1,601, Marble Falls 1,700 ft., Barnett 1,826 ft., Ellenburger 1,890 ft., sulfur water at T.D. 1,962 ft., dry.

Shackelford County

Semiwildcat: P. S. Kendrick 1 Mathews, NE Sec. 36, B.A.L. Sur., dry at 840 ft.
Moran field: W. A. Cox 1 Pool, dry at 387 ft.
Newell field: Fortex Oil 1-A Newell, 40 bbl., pumping, 10-qt. shot, 1,116-83 ft.
Kendrick Oil, Ltd. 1 Newell, water sand 1,530-35 ft., dry at 1,535 ft.
Nail field: Hickok & Reynolds 10-A Nail, 80 bbl., flowing and pumping, 1,582-87 ft.
Gorsuch field: Gorsuch Oil 7 Gorsuch, dry at 1,558 ft., water.

SOUTHEAST NEW MEXICO COMPLETIONS

Eddy County

Loco Hills field: R. W. Fair 3-A State, SW SW NW 32-17-30, 68 bbl. oil in 3 hr., open tubing, 30-qt. shot, 2,877-93 ft.
Root field: Fulton-Folkner 2 Root, C SE NE 12-17-29, abandoned location.
Maljamar field: Skelly 1-B Lea, C NE SE 23-17-31, 84 bbl. daily, open tubing, 790-qt. shot, 3,478-3,880 ft.
Artesia field: Roeal Oil 5 Saunders, SW SE SE 13-17-27, 5 bbl. daily, pumping, tubing, 40-qt. shot, 520-37 ft.
Crumley 2 Levers-State, SW SW SW 34-17-28, 30 bbl., pumping, in 12 hr., 50-qt. shot, 2,192-2,400 ft.
Wildcat: G. M. Cone 1 Hare, NW NW SE 14-16-28, temporarily abandoned, 1,448 ft.
Clark-LaNeve 1 Boulter, NE SE NW 28-19-27, dry at 1,508 ft., slight show from 885-90 ft., 10-qt. shot, tested dry.

Lea County

Eunice field: Continental Oil 1-F-4 State, Lot 1, Sec. 1-21-36, flowed 9½ bbl. oil in 6 hr., 15/64-in. choke, 3,636-3,780 ft., 320-qt. shot.
Vacuum field: Devonian Oil 1 Dean-State, C SE SE 23-17-35, location abandoned.
Maljamar field: Maljamar Oil 13-A Baish, C SE SW 21-17-32, flowed 150 bbl. daily, ¾-in. choke, naturally, 4,025-62 ft.
Barney Cockburn 18-B Baish, C SE SW 27-17-32, flowed 165 bbl. in 7½ hr., open tubing, 200-qt. shot, 4,030-86 ft.
Barney Cockburn 25-B Baish, C NW SE 28-17-32, flowed 376 bbl. in 8 hr., open tubing, 300-qt. shot, 3,547-3,925 ft.

Discovery Is in Prospect on Ector-Andrews County Line

By R. MARNE SANFORD

MIDLAND, Tex., Dec. 23.—Majority of interest the past week in the West Texas district was centered on Ector County where a new discovery was in prospect for the extreme northern part and where a new 1½-mile south outpost was staked to a recent discovery in the south central part.

Just south of the Andrews County line and about 1½ miles northwest of the north end of the North Cowden field in Ector County, Stanolind Oil & Gas Co. is indicating the discovery of a new Permian lime field as drilling proceeds slowly below 4,315 ft. in 1-B Cowden. The test is located in Section 12, Block 44, Township 1n, T.&P. Survey, about a mile west of the Stanolind 1 Cowden, a 97-bbl. producer completed several months ago from the deep Holt horizon. The well was started as a Holt level test but found shows of gas from 4,255-58 ft. and encountered shows of oil from 4,260-70 ft. It has shown various amounts of oil on tests at different levels and at 4,313 ft. tested 17 gal. of oil and 6 gal. of water in 1 hour.

It was announced that the test would be carried to the deep Holt pay for production attempts, but would plug back and attempt completion from the 4,300-ft. level should the lower zone prove barren. The 4,300-ft. level which showed oil has been identified as the same zone which is productive in the large Goldsmith field just 5 miles to the southwest.

In the south central part of Ector County Forest Development Corp. has quit its ¾-mile west outpost to its discovery well, 1 Bradley. The test was quit at a total depth of 4,394 ft. after recovering a core which showed 3 ft. of slightly porous lime carrying sulfur water.

SUMMARY OF COMPLETIONS

Southern West Texas

	No.	Bbl.	Footage
Oil wells: Waddell field	2	8,302	9,012
Ector County fields	6	4,073	24,672
Estes field	2	3,215	5,715
Wildcat discovery	1	3,198	9,187
Other fields	4	7,959	12,650
Dry holes: Duro field	1	.....	4,394
Total	16	.....	65,630

Northern West Texas

	No.	Bbl.	Footage
Oil wells: Seminole field	8	4,195	42,285
Slaughter	2	2,136	10,035
Wasson	4	4,066	20,781
Other fields	2	1,536	6,083
Dry holes: Wildcats	2	.....	8,307
Total	18	.....	87,491

Southeast New Mexico

	No.	Bbl.	Footage
Oil wells: Fields	8	2,506	25,563
Dry holes: Wildcats	2	.....	2,956
Total	10	.....	28,519

Tubb Extension in Large Flow

Record flow for the northeast extension area of the Tubb Permian lime field in Crane County was registered at the Gulf 14 Waddell, Section 29, Block 26-B, P.S.L. Survey, a ¼-mile east extension for the north end of the field. The well made a daily rating of 7,709 bbl., second only to Gulf 2 Tubb which was completed for 8,424 bbl. The gas volume of the new well was measured at 3,980,000 cu. ft. daily and the pay section, bottomed at 4,527 ft., was treated with 5,000 gal. of acid.

SOUTHERN WEST TEXAS COMPLETIONS

Crane County

Waddell field: Gulf 14 Waddell, 7,209 bbl., open tubing, 5,000 gal. acid, 4,369-4,524 ft.
Gulf 15 Waddell, 1,093 bbl., tubing and casing, 5,000 gal. acid, 4,352-4,488 ft.
Tubb field: Humble 42 Tubb, 1,682 bbl., open tubing, 1,000 gal. acid, 4,308-4,410 ft.
Jordan field: Texas 6-D University, 3,814 bbl., naturally, open casing 3,529-59 ft.

Ector County

Johnson field: Atlantic 8-A Johnson, 714 bbl., open tubing, 650-qt. shot, 4,075-4,245 ft.
Atlantic 6-E Johnson, 593 bbl., plus 5 per cent water, open tubing, 440-qt. shot, 4,130-4,245 ft.
Atlantic 4-J Johnson, 538 bbl., 1-in. choke, 360-qt. shot, 4,085-4,150 ft.
Jordan field: Cities Service 7-C University, 519 bbl., ¾-in. choke, 144-qt. shot, 3,573-3,613 ft.
Duro field: Forest Development 2 Bradley, top anhydrite 1,700 ft., Yates 2,890 ft., solid lime 3,840 ft., San Andres 4,225 ft., dry 4,394 ft.
North Cowden field: Rhodes & Tompkins and Great Western Prod. 3 Maurice, 616 bbl., tubing, 370-qt. shot, 4,120-4,245 ft.
Great Western Prod. 10 Johnson, 1,093 bbl., tubing, 790-qt. shot, 3,910-4,174 ft.

Pecos County

Lehn field: R. G. Pattillo 16-B Sullivan, 111 bbl., ½-in. choke, naturally, 1,668-95 ft.

Ward County

Wildcat discovery: Gulf 5 Wristen, Sec. 18, Blk. 5, H.& T.C. Sur., 1,599 bbl. in 12 hr., open casing, 7,018-60 ft., P.B from T.D. of 9,187 ft. in Ellenburger; top Silurian 6,835 ft., lower Silurian 6,935 ft., Montoyo 7,200 ft., Simpson 7,400 ft., Ellenburger 9,002 ft.
Estes field: Texas 7-E University, 3,135 bbl., tubing, 465-qt. shot, 2,445-2,685 ft.
Mid-States Oil 10 Sloan-Llano, 80 bbl., pumping, 3,500 gal. acid, 2,940-3,030 ft.

Winkler County

Keystone field: Bates-Reading 5 McCabe, 392 bbl. in 4 hr., naturally, open tubing, 2,810-2,986 ft.

NORTHERN WEST TEXAS

Borden County, in the northern part of the Permian basin and immediately north of Howard County, was given a new wildcat test at the close of the past week when B. C. Mann announced location for 1 Dennis, a projected 3,800-ft. test. The location is in the NW NE Section 151, Block 25, H.&T.C. Survey, about 7 miles northwest of the Sharon field in Scurry County. It is scheduled to start by February 1 of the coming year and is projected to the San Angelo lime which produces in the Sharon field. The operator recently acquired his block in the county when he leased eight sections of land, both in Borden and in Scurry counties. The land was out of the ranch of Jack Canning of Snyder and the three Dennis brothers of Fort Stockton, San Angelo and Snyder.

Cochran County

The possibility was still strong at the close of the week for a 2½-mile west extension to the Duggan area of the large Slaughter-Duggan field of Hockley and Cochran counties. Ray R. Rhodes and Atlantic 1 C. S. Dean, League 89, Lipscomb County School lands, 2½ miles west of the Duggan area, reported a rising fluid column, about 40 per cent of which was reported to be oil. The test was being cleaned out at 5,100 ft., there

(Continued on Page 292)

Wildcats Show Saturation on Both Flanks of Barton Arch

By ROBERT INGRAM

THE Ray pool in Phillips County which touched off the leasing play in western Nebraska and northwestern Kansas along the Barton arch was extended almost ½ mile north and east by a good show in Cities Service 1 Hansen, SW NW NW 33-5s-20w. Cuttings from a lime formation, probably the Arbuckle, were saturated with oil and operators are rigging up standard tools to complete the test.

SUMMARY OF COMPLETIONS

Kansas

	No.	Bbl.	Footage
Oil wells: Silica	1	900	3,302
Cunningham	1	511	3,480
Stoltenberg	2	3,150	6,551
Bornholdt	1	975	3,354
Hall-Gurney	1	1,484	2,906
Zenith	1	778	3,765
Other fields	10	7,326	29,238
Dry holes: Fields	5	.....	16,565
Wildcats	5	.....	17,486
Total	27	.....	86,647

Missouri

Dry holes: Wildcats	2	.....	2,865

The Lansing was topped at 3,352 ft. Total depth was 3,571 ft. with casing set at 3,568 ft.

To the south of the Ray pool, in Rooke County, the Atlantic Refining Co. and Helmerich & Payne 1 Baumgarten, a wildcat in E½ SE NW 25-9-19w, some 6½ miles north of the Zurich pool, was abandoned after drilling to a total depth of 3,692 ft. Light spotted stains of oil showed in cores from the Arbuckle lime at 3,675 to 3,692 ft., and there were other shows in cores from 3,675 to 3,682 ft. and from 3,670-92 ft.

Cities Service 1 Crandall, a wildcat in western Reno County, C NW NE 23-23-10w, apparently opened up a new Viola lime producing area northeast of the Zenith pool of Stafford County. Operators found a saturated core from 3,785-98 ft. and set 7-in. casing at 3,785 ft. The test is some 7 miles northeast of the prolific Stafford County producing area, which also is productive from the Viola.

Lion Oil & Refining 1 Worth, W½ SW SE 10-16-19w, in Rush County, set pipe at the top of the Reagan sand, at 3,710 ft., where rotary cuttings showed saturation. The venture marks Lion's initial project in Kansas.

DAILY AVERAGE PRODUCTION
LEADING KANSAS FIELDS

	Dec. 21	Dec. 14
Burrton	7,150	7,250
Ritz-Canton	3,850	3,900
Graber	2,500	2,750
Hollow-Nikkel	1,700	1,650
Voshell	1,750	1,800
Wellington	1,050	1,150
Lorraine	1,200	1,300
Stoltenberg-Wilkins	3,410	5,320
Bloomer	5,300	5,400
Chase	5,050	5,150
Geneseo	4,850	4,650
Silica	16,200	17,500
Wherry	3,000	3,700
Trapp district	17,850	15,400
Balance Russell County	20,750	20,450
Sedgwick County	3,200	3,200
Bemis	9,600	8,850
Burnett	5,900	5,350
Kingman County	1,030	790
Stafford County	11,370	11,695
Greenwood County	8,750	8,100
El Dorado	7,150	7,150
Total Kansas	199,700	199,050

KANSAS COMPLETIONS

Barton County

Trapp pool: Stanolind 1 Ehrlich, C E½ NE NE 14-16-14w, dry, T.D. 3,407 ft., Topeka 2,825 ft., Lansing 3,160 ft., Sooy 3,340 ft., Arbuckle 3,360 ft.
Silica pool: Virginia Drlg. 2 Clawson, N½ SW SW 17-20-11w, swabbed 900 bbl., Arbuckle 3,290-3,302 ft. I.T.I.O. 4 Burchart, S½ NW NE 14-20-11w, dry, T.D. 3,333 ft., swabbed 2 bbl. oil at 3,202 ft.
Wildcat: I. K. Owens et al 1 Burmeister, S½ SE NW 20-17-11w, dry, T.D. 3,466 ft., Topeka 2,745 ft., Lansing 3,120 ft., Sooy 3,410 ft., Arbuckle 3,441 ft., show oil 3,030-40 ft.

Butler County

Augusta pool: Cities Service 45 Moyle, SE SE SW 11-28-4, pumped 55 bbl., Kansas City 2,094-2,102 ft., acid.
Douglas pool: L. & M. Oil 2 Creed, SW SE SW 17-29-4, pumped 25 bbl., Lansing 1,860-87 ft., acid.

Ellis County

Blue Hill pool: J. J. Hall 10 Smith, EL NW NE 14-12-16w, pumped and flowed 2,960 bbl., Lansing 3,069-3,216 ft., acid.
Wildcat: Central Pet. 1 Wellbrock, NW NW NE 32-14-16w, dry, T.D. 3,452 ft., Topeka 2,900 ft., Arbuckle 3,433 ft., slight porosity and saturation 3,240-50 ft.

Ellsworth County

Stoltenberg-Wilkens pool: Magnolia 4 Schroeder, W½ SE SW 26-16-10w, swabbed 34 bbl. 3 hr., Arbuckle 3,308-16 ft.
Cities Service 4 Mehl, S½ SW NE 19-17-9w, 3,000 bbl., Arbuckle 3,218-35 ft.

Greenwood County

Thrall pool: Sinclair 24 McKee, SE NE NW 32-23-10.

(Continued on Page 295)

Gas Wells in Knox County Maintain High Record

By STAFF CORRESPONDENT

NEWARK, Ohio, Dec. 23.—Ohio reports 28 completions, 12 gas, 6 oil, and 10 dry. Activity at Danville in Knox County continues with a 3,000,000-cu. ft. gasser. A wildcat Clinton test in Lawrence County in South Central Ohio proves dry.

The deep test in the Central Ohio region by McCloy, Inc., in Jersey Township, Licking County, on N. A. Rowe tract, Section 21, is drilling at 4,270 ft., 305 ft. below the Trenton formation. A sample analysis logs the Trenton 3,320-3,965 ft. Small amounts of water were had at 4,036 ft. and 4,015-85 ft.

In Columbiana County Natural Gas Co. of West Virginia was delayed in the Oriskany test on the William Tice farm, Section 19, Wayne Township, with a fishing job after dropped casing which was being run to the Onondaga lime at 4,177 ft. The hole is now clear and work will be resumed. In Belmont County their test on the E. A. Mobley farm, scheduled for the Clinton sand, is drilling at 7,123 ft.

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Indiana			
Dry holes	8	.....	17,382
Oil wells	2	525	5,058
Total	10	.....	22,440
Ohio			
Oil wells	6	22	4,340
Gas wells	12	*11.5	25,716
Dry holes	10	.....	24,788
Total	28	.....	54,844
Input wells	2	.....	871
Western Kentucky			
Oil wells	4	45	1,718
Dry holes	6	.....	4,762
Total	10	.....	6,480
Eastern Kentucky			
Oil wells	1	6	(‡)
Gas wells	14	*10.4	†26,603
Dry holes	5	.....	8,047
Total	20	.....	34,650

*Million cu. ft. †3 wells not reported. ‡Not reported.

Athens County

Canaan Township: Ohio Fuel 1 Joseph Koker, Sec. 17, 30,000 cu. ft. gas, second Berea, T.D. 1,620 ft.
Rome Township: Brooks Johnston 1 H. H. Starlin, Sec. 30, 300,000 cu. ft. gas, Macksburg, T.D. 800 ft.
J. A. Wickens 1 Louis Meek, Sec. 16, 80,000 cu. ft. gas, Salt sand, T.D. 830 ft.
Gifford et al 5 J. E. Parmiter, Sec. 30, 2 bbl., shot, first Cow Run, T.D. 441 ft.

Belmont County

Washington Township: L. R. Shores 3 Albert Eamsey, 3 mi. N of Captina, Sec. 6, 7 bbl., lime, T.D. 1,420 ft.

Guernsey County

Valley Township: Jewell Gas Co. 2 Daniel Miller, Sec. 11, 120,000 cu. ft. gas, Berea, T.D. 1,187 ft.

Holmes County

Paint Township: Ohio Fuel 1 E. J. Miller, Sec. 35, dry, Clinton, T.D. 4,179 ft.

Knox County

Butler Township: Knox Exploration Co. 1 Perry Fry, Lot 7, 3,000,000 cu. ft. gas, Clinton sand, T.D. 2,800 ft.
Union Township, village of Danville: H. E. Perkins, 2 Charles Mickley, Sec. 5, 3,100,000 cu. ft. gas, Clinton, T.D. 2,763 ft.

Lawrence County

Elizabeth Township: Kachelmacher Estate 2 Mineral Products Co., Sec. 26, dry, Clinton 2,831-49 ft., T.D. 2,861 ft.

Newark Field—Licking County

Mary Ann Township: Ohio Fuel 2 Roy Nesbit, Sec. 15, dry, Clinton, T.D. 2,562 ft.
McKean Township: Heisey Gas Co. 1 C. C. Jeffries, fourth quarter, dry, Clinton, T.D. 2,305 ft.
Newton Township: Penick et al 1 Levi Lynn, fourth quarter, 270,000 cu. ft. gas, Clinton, T.D. 2,590 ft.

Lorain County

Penfield Township: Ohio Fuel 3 L. M. Betts, Lot 18, Sec. 2, 2,250,000 cu. ft. gas, Clinton, T.D. 2,435 ft.

Medina County

Chatham Township: Thornton Producing Co. 41 Daniel Ross, Tract 13, Lot 7, 5 bbl., Berea, T.D. 478 ft.
Thornton Producing Co. 42 Daniel Ross, 5 bbl., Berea, T.D. 495 ft.
Thornton Producing Co. 025 Sanford & Watson, Tract 10, Lot 3, input well, Berea, T.D. 538 ft.
Thornton Producing Co. 026 Sanford & Watson, input well, Berea, T.D. 353 ft.
York Township: W. E. Sawyer 2 P. J. Wilbur, Lot 16, Tract 6, 1 bbl., Berea, T.D. 524 ft.

Meigs County

Sutton Township: Home Utilities Co. 1 Irving Karr, Fraction 300, 20,000 cu. ft. gas, Ohio shales, shot, T.D. 3,065 ft.
Summer Oil & Gas Co. 5 William D. Roush, Sec. 30, Berea, deepened to Ohio shales, 20,000 cu. ft. gas, shot, T.D. 3,205 ft.

Monroe County

Summit Township: A. E. Robinson et al 1 Etta Baker Sec. 5, dry, Berea, T.D. 1,910 ft.
Sunsbury Township: Barnesville Dev. Co. 1 Jonethon Carpenter, Sec. 35, dry, T.D. 2,260 ft.

Morgan County

Marion Township: Crowley et al 4 Earl Bowman, Lot 7, 2 bbl., shot, first Cow Run 405-35 ft. (Brill sand dry), T.D. 982 ft.
Breman Oil & Gas Co. 2 George Peters, Lot 13, dry, Brill, T.D. 1,036 ft.

Noble County

Wayne Township: Yoker Valley Gas Co. 3 George W. Ankrom, Sec. 28, 350,000 cu. ft. gas, Berea, T.D. 1,550 ft.

Perry County

Monroe Township: Ruth 21 A. G. Post, Sec. 27, dry, Berea, T.D. 1,173 ft.
Reading Township: Ohio Fuel 1 William Rousculp, Sec. 4, 1,400,000 cu. ft. gas, Clinton, T.D. 3,076 ft.

Stark County

Plain Township: Kemrow Co. 1 H. N. Firestone, Sec. 11, dry, Clinton 4,636 ft.

Wayne County

Plain Township: Kemrow Co. 1 F. G. Kean, Sec. 32, 540,000 cu. ft. gas, Clinton, T.D. 3,000 ft.

Washington County

Dunham Township: Ohio Fuel 1 Clara Berg, Sec. 6, dry, Berea, T.D. 1,893 ft.

INDIANA

EVANSVILLE, Ind., Dec. 23.—Eleven wells were completed in Indiana during the past week. Of these, two were oil wells and eight were dry holes. The two producers were located in Gibson County and had an initial production of 525 bbl. A St. Peter test in Benton County found fresh water and was abandoned.

INDIANA COMPLETIONS

Benton County

A. C. Thomas et al 1 Fowler NW NW NW 27-25n-9w
Dry, St. Peter 1,705 ft., filled with fresh water, T.D. 1,750 ft.

Gibson County

Continental 1 Green SW SW SE 26-3s-14w
Dry, tested water 2,128-85 ft., 2,109-16 ft., T.D. 2,942 ft.
Continental 18 Bozeman SW SW NE 14-3s-14w
Pumped 225 bbl., natural, pay 2,517-36 ft., T.D. 2,542 ft.
Hall Edwards 14-A Maier NE NW SE 14-3s-14w
Flowed est. 300 bbl., natural, T.D. 2,516 ft.

Knox County

W. C. McBride 1 Brevoort SW NE NW 1-2n-11w
Dry, tested water 1,860-66 and 1,816-34 ft., T.D. 1,973 ft.

Martin County

Newton P. L. 1 Ash NW NW SW 31-4n-4w
Dry, H.F.W. 314-22 ft., T.D. 343 ft.

Pike County

G. W. Miller 1 J. R. Nixon ..... SE SW NE 14-3s-8w
Dry, T.D. 4,600 ft.

Posey County

W. C. McBride 8 Swanders NE NE NE 4-4s-14w
Dry, T.D. 2,980 ft. Will use for salt-water disposal.
H. G. Lewis et al 2 Wolfe . . . . . NW SE NE 25-7s-15w
Dry, T.D. 2,154 ft.

Spencer County

H. M. Hunt et al 1 Seay-Miller Comm. W½ NW SW 32-7s-6w
Dry, sand 623 ft., water 636 ft., no shows, T.D. 640 ft.

Vanderburg County

White et al 1 Hurdink . . . . . NW NW SE 4-6s-10w
Location abandoned.

WESTERN KENTUCKY COMPLETIONS

Daviess County

Cane Run School district: Cane Run Petroleum 11 Zula Johnson, dry through Jett sand, T.D. 697 ft.

Grayson County

Leitchfield district: Leitchfield Oil & Gas 4 Joseph Dinwiddie, dry, T.D. 1,127 ft.

Ohio County

Fordsville district: R. R. Hart et al 6 Clark heirs, 15 bbl., 60-qt. shot, Jett sand 286-94 ft.
Friendship Church district: Henry Scholl 6 Elmer Royal, 10 bbl., 60-qt. shot, Barlow sand 795-809 ft., T.D. 812 ft.
Trisler School district: Grewe & Schmidt 2 C. Whittinghill, temporarily abandoned at 610 ft., through Barlow sand.
Ralph district: G. H. Brenner et al 3 Joe Bellamy, dry through Barlow sand, T.D. 918 ft.
Sunnydale district: J. R. Williams 2 A. D. Miller, dry, T.D. 1,315 ft.
Pleasant Grove Church district: H. Ogle et al 2 Pleasant Grove Church lot, est. 20 bbl., Jett sand 310-32 ft.
United Petroleum Co. 4 R. I. Miller, 10 bbl., 60-qt. shot, Jett sand 278-300 ft.
W. H. Parks et al 3 Arthur Dalton, abandoned at 95 ft.

EASTERN KENTUCKY COMPLETIONS

Martin County

Warfield Gas Co. 4979 Joanah Preece, 1,641 cu. ft. gas, Big lime 1,346 ft.
Warfield Gas Co. 4988 H. C. Cassaday, Apple Orchard, 1,187,000 cu. ft. gas, Maxon 1,095 ft.
Warfield Gas Co. 4980 W. T. Alley No. 1, Big Elk Creek, 5,523 cu. ft. gas, Big lime 1,564 ft.
Virginian G. & O. Co. 1288-V Federal Gas Oil Co., Coldwater Creek, dry 1,476 ft.
E. E. Cunningham 1 Sam Endicott, Little Laurel Creek, 340,000 cu. ft. gas, shale, shot, 2,703 ft.
Ware et al 1 Nancy Pinson, Blocklog Fork, 516,000 cu. ft. gas.

Pike County

United Carbon 865 W. S. Wells No. 1, Levisa Fork, 3,898,000 cu. ft. gas, shale, 2,955 ft.
United Carbon 867 Mason Coal & Gas Co., Levisa Fork, 158,000 cu. ft. gas, shale, 3,824 ft.
United Carbon 868 S. Shelby, Red Branch, 355,000 cu. ft. gas, shale and 103,000 cu. ft. gas, Big lime, 3,701 ft.
United Carbon 6 Kycoga Land Co., Alum Cave, 2,010,000 cu. ft. gas, shale, 3,180 ft.
Hamilton Gas Co. 1-H Orison Smith, Meathouse Branch, 152,000 cu. ft. gas, Maxon, 1,798 ft.
Hamilton Gas Co. 2-H Orison Smith No. 2, Pigeonroost, 551,000 cu. ft. gas, Salt sand 1,255 ft.
Warfield Gas Co. 4891 D. M. Coleman et al, on Island Creek, 57,000 cu. ft. gas, T.D. 3,182 ft.

Floyd County

Jones & Lindsey 2 St. Paul Coal Co., Levisa Fork, 6 bbl.
Jones & Lindsey 2 Highland Coal Co., Levisa Fork, dry at 2,881 ft.
F. Williams 1 Stanley heirs, Mare Creek, 1,000,000 cu. ft. gas.
J. Allen et al 1 Jeff Jarvis, Home Branch, dry, Big lime, acid, 1,650 ft.
Kentucky-West Va. 5277 N. P. Harris, Long Branch, 150,000 cu. ft. gas.

Estill County

Snowden Oil Co. 2 Harris heirs, Sta Camp, dry, 840 ft.

Morgan County

Jenkins et al 1 Rolla Dixon, Pasture Creek, dry, 1,200 ft., show in Weir.

Permian Basin

(Continued from Page 291)

being about 3,000 ft. of fluid in the hole. It has been shot with 210 qt. from 5,050 to 5,102 ft. after plugging back from an original total depth of 5,111 ft. to shut off water.

NORTHERN WEST TEXAS COMPLETIONS

Andrews County

Means field: Osage Drilling 6 University, 1,386 bbl., open tubing, 1,500 gal. acid, 4,238-4,303 ft.
Wildcat: Phillips 1-125 Embar, dry at 2,500 ft.

Gaines County

Seminole field: Amerada 3 Averitt, 176 bbl., tubing, 2,000 gal. acid, 5,174-5,233 ft.
Amerada 2 Crain, 486 bbl., ½-in. choke, naturally, 5,214-5,370 ft.
Magnolia and Atlantic 6-195 H.&J., 530 bbl., ½-in. choke, naturally, 5,119-5,231 ft.
Magnolia and Atlantic 4-217 H.&J., 443 bbl., ½-in. choke, naturally, 5,160-5,323 ft.
Magnolia and Atlantic 14-219 H.&J., 568 bbl., ½-in. choke, naturally, 5,127-5,259 ft.
Magnolia and Atlantic 7-251 H.&J., 552 bbl., ½-in. choke, naturally, 5,105-5,299 ft.
Magnolia and Atlantic 8-251 H.&J., 670 bbl., ½-in. choke, naturally, 5,510-5,281 ft.
Ohio 5 Tippett, 770 bbl., ½-in. choke, 2,000 gal. acid, 5,120-5,289 ft.

Hockley County

Slaughter field: S. W. Richardson 8 Slaughter, 1,060 bbl., 3,000 gal. acid, 4,885-4,990 ft.
Stanolind 16-B Slaughter, 1,076 bbl., 3-in. casing outlet, 4,940-5,045 ft.

Scurry County

Sharon field: B. R. S. Oil 1-A Chapman, 150 bbl., pumping, 200-qt. shot, 1,660-1,780 ft.

Terry County

Wildcat: Sloan & Zook 1 W. E. Bailey, Sec. 103, Blk. 4-X, P.S.L. Sur., top anhydrite 2,450 ft., Yates 3,470 ft., brown lime 4,420 ft., Grayburg 4,700 ft., solid lime 4,940 ft., dry at 5,807 ft.

Yoakum County

Wasson field: Aloco Oil 8-B Miller, 1,533 bbl., tubing, 10,000 gal. acid, 4,860-5,193 ft.
Don Danvers 10 Willard, 684 bbl., 1-in. choke, 9,000 gal. acid, 5,060-5,273 ft.
Humble 9 Randall, 651 bbl., ⅞-in. choke, 8,500 gal. acid, 4,990-5,130 ft.
Shell 14-AX Baumgart, 1,198 bbl., tubing, 6,000 gal. acid, 4,890-5,185 ft.

(Southeast New Mexico completions on Page 288)

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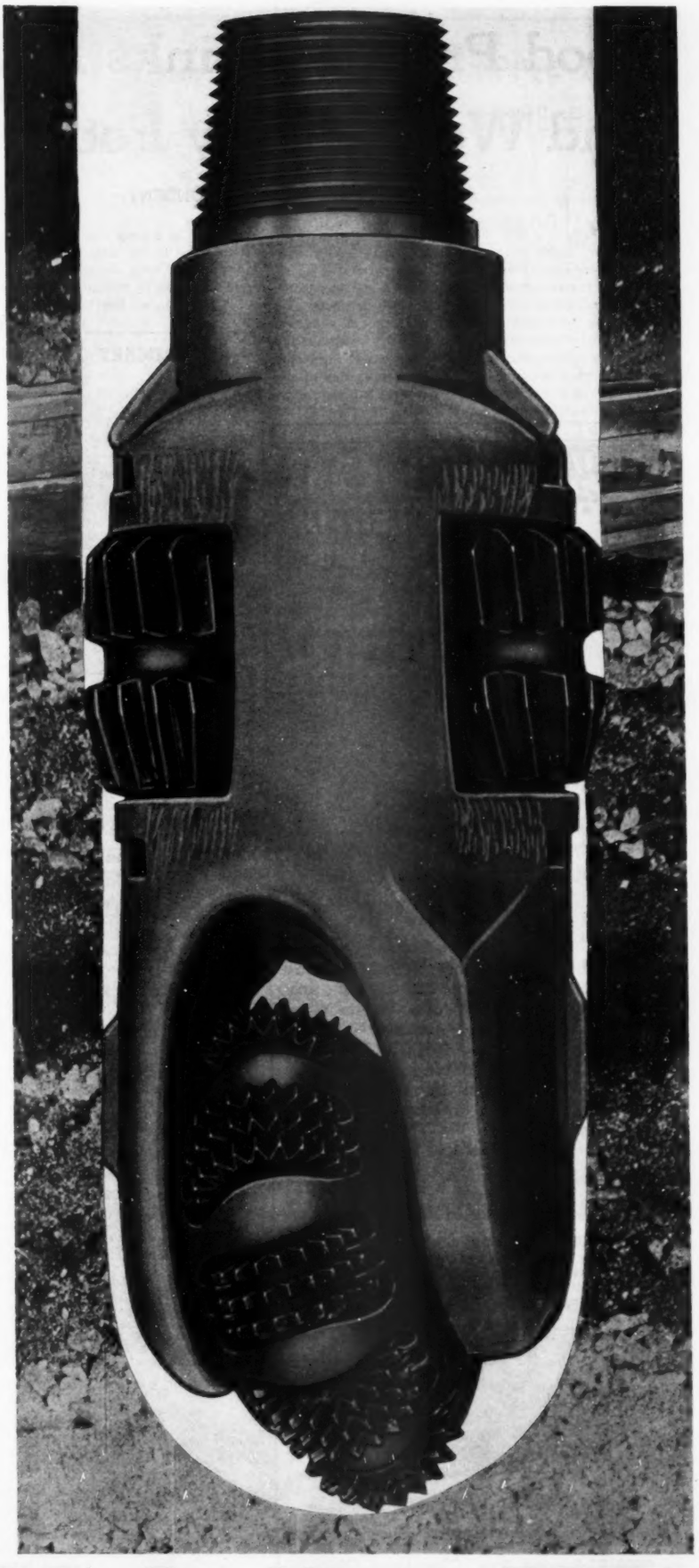

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Good Producer Links Dundas And West Liberty Pools

By STAFF CORRESPONDENT

MATTOON, Ill., Dec. 23.—Initial production of completed wells in Illinois declined to about two-thirds of its normal value during the past week as activity for the state dropped to a point considerably below normal. Of 44 completions, 15 were dry holes and 29 were oil wells with an initial production of 7,438 bbl. White County completions which usually maintain the high initial production for the state dropped far below normal during the week. Of the 12 completions in the county, 9 were producers and 1 was dry. Initial production for the county was 2,025 bbl. Three of the completions were in the East Calvin pool. The remaining 26 completions were scattered throughout the basin area and included 11 producers with an initial production of 3,215 bbl., or 292 bbl. per well.

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Oil wells: Louden	2	718	3,050
Hoodville	2	279	5,406
Salem	2	279	5,594
Enterprise	3	927	9,285
East Calvin	3	378	8,303
Other White County pools	3	588	8,608
Other pools	8	1,732	20,696
Wildcats	6	2,537	15,501
Dry holes: Fields*	6	.....	15,526
Wildcats	9	.....	13,909
Total	44	.....	105,878
Salt-water disposal well	1	.....	1,038
Recompletions	1	324	.....

*Albion 1, Patoka 1, Olney 1, East Keensburg 1, Enterprise 1, West Irons 1.

Jasper County

Pure 1 Telford Consol., E½ NE SW 20-5n-10e, Jasper County, was the best well completed during the past week. The well flowed 1,323 bbl. after an acid treatment of 5,000 gal. in the McClosky at 2,778-83 ft. This well is located approximately half way between the Dundas and West Liberty pools and may prove to be a link between the two McClosky pools.

Clinton County Wildcat

Bell 1 Maibaum, NE NE SE 12-3n-3w, a Benoist test about 8 miles north of Carlyle, Clinton County, is to be abandoned. This well produced salt water and a small amount of oil when plug was drilled to test the Benoist sand at 1,152-59 ft. Total depth is 1,159 ft.

Bell Oil Co. has announced that it will drill a deep well in this same area, at least to the Devonian and possibly to the Trenton. Exact location of the test has not been decided on, but it will probably be either in Section 7 or 8-3n-2w.

Bond County

Womack pool: Magnolia 6 W. H. Griggs, SE SE NE 9-6n-2w, salt-water disposal well, Renault 1,028 ft., T.D. 1,038 ft.

Wildcat: J. Harding 1 Gottfried, NE NW NE 28-5n-4w, dry, Pottsville 620-50 ft. (slight show oil), Benoist 701-08 ft., Cypress 735 ft., T.D. 940 ft., P.B. 639 ft.

J. B. Barnes 1 Watts, NE SW NE 7-5n-2w, dry, Cypress sand 1,004 ft., Benoist 1,140 ft., Ste. Genevieve 1,219 ft., Devonian 2,496 ft., T.D. 2,565 ft.

Clinton County

Wildcat: C. Bell 1 Maibaum, NE NE SE 12-3n-3w, dry, No. 6 coal 414 ft., Glen Dean 848 ft., Hardinsburg 878 ft., Golconda 897 ft., Cypress 1,005 ft., sand 1,021 ft., Paint Creek 1,095 ft., Benoist 1,152-59 ft., show oil, H.F.W. 1,165 ft.

Edwards County

Albion pool: Continental 1 Conover, SE NE SW 13-2s-10e, dry, Base Pennsylvanian 2,193 ft., Menard 2,349 ft., Vienna 2,480 ft., Glen Dean 2,582 ft., Golconda 2,686 ft., Benoist 2,998 ft., Ste. Genevieve 3,143 ft., T.D. 3,242 ft., P.B. 3,017 ft.

Edgar County

Wildcat: J. P. Economos 101 Wieland, NE NE NE 3-13n-14w, dry, sand 130 ft., slight show oil, T.D. 177 ft.

Fayette County

Louden pool: Magnolia 29 T. C. Clow, NW NE NW 5-7n-3e, flowed 318 bbl., 20-qt. shot, Cypress 1,407-52 ft., 30-qt. shot Benoist 1,490-1,502 ft., T.D. 1,502 ft., P.B. 1,442 ft.

Magnolia 30 T. C. Clow, N½ NE NW 5-7n-3e, pumped and flowed 400 bbl., 10-qt. shot Cypress 1,456-85 ft., 40-qt. shot Benoist 1,532-48 ft.

Franklin County

Thompsonville pool: Anderson & Davis 1 Searles, NE NE NW 34-7s-4e, pumped 110 bbl., 2,500 gal. acid, McClosky 3,172-89 ft.

Gallatin County

Wildcat: D. Gammel 1 Frey, S½ SW NE 19-8s-10e, pumped 18 bbl. oil and 150 bbl. water, 10-qt. shot, 1,842-52 ft., Glen Dean 2,202 ft., Ste. Genevieve 2,696 ft., T.D. 2,770 ft., P.B. 1,857 ft.

Hamilton County

Hoodville pool: Texas 3 G. G. Edwards, SW SW SW 35-5s-6e, pumped 120 bbl., 5-qt. shot, Benoist 2,932-49 ft.

Carter 1 Friel, NW SW SE 27-5s-6e, pumped 159 bbl., 10-qt. shot, Benoist 2,950-57 ft.

Jasper County

West Liberty pool: Pure 1 Telford Consol., E½ NE SW 20-5n-10e, flowed 1,323 bbl., 5,000 gal. acid, McClosky 2,778-83 ft., T.D. 2,820 ft.

Wildcat: M. Schieck 2 Payne heirs, NW NE NE 5-5n-10e, flowed 1,300 bbl., 5,000 gal. acid, 1,244 bbl. natural, McClosky 2,773-79 ft., T.D. 2,807 ft.

Anderson & Vorhees 1 A. Pippen, SE NW SW 16-8n-10e, dry, Glen Dean 2,055 ft., Cypress 2,178 ft., Renault 2,370 ft., Aux Vases 2,431 ft., Ste. Genevieve 2,477 ft., McClosky 2,550-57 ft., St. Louis 2,562-68 ft., T.D. 2,600 ft., 1,000 and 2,000 gal. acid, pumped 2 bbl. oil and 190 bbl. water.

Lawrence County

Wildcat: Harper et al 3 C. Cronin, SE SW NW 24-3n-13w, location abandoned.

Macoupin County

Wildcat: Williams et al 1 Morrison, NW NW SE 22-8n-8w, dry, Pottsville 495 ft., T.D. 505 ft., elev. 645 ft.

Madison County

Wildcat: Bragassa 1 G. K. Hughey, NE NE SE 9-3n-6w, dry, Cypress 865 ft., sand 891 ft., Benoist 1,026-32 ft. (water), Renault 1,038 ft., Aux Vases 1,058 ft. (water), T.D. 1,060 ft.

Marion County

Patoka pool: Adams 1 Heinzman, NE NE NW 32-4n-1e, dry, Tar Springs 1,087 ft., Glen Dean 1,192 ft., Hardinsburg 1,175 ft., Golconda 1,185 ft., Cypress 1,293 ft., sand 1,328 ft. (water), Paint Creek 1,380 ft., Benoist 1,443 ft., Aux Vases 1,463 ft. (water), Ste. Genevieve 1,564 ft., Rosiclare 1,582 ft., T.D. 1,594 ft.

Salem pool: Texas 86 City of Centralia, SW SE SW 4-1n-2e, pumped 4 bbl., 3,000 gal. acid, McClosky 2,062-65 ft., 2,070-75 ft., T.D. 2,099 ft.

Texas 87 City of Centralia, SE SE NE 5-1n-2e, flowed 275 bbl., 5,000 gal. acid, Devonian 3,448-86 ft., T.D. 3,495 ft.

Richland County

Dundas pool: Pure 2 P. Meyers-B, NE SE NE 13-4n-9e, pumped 30 bbl. oil and 15 bbl. water, 5,000 gal. acid, McClosky 2,907-12 ft., 2,920-23 ft., T.D. 2,935 ft.

Pure 2 P. Meyers-A, E½ NW SW 7-4n-10e, flowed 132 bbl., McClosky 2,945-55 ft., T.D. 2,975 ft.

Olney pool: Wayne Dev. 1-B Wattleworth, W½ SW NE 26-4n-10e, dry, Glen Dean 2,490 ft., Cypress 2,674 ft., sand 2,728-2,827 ft., Aux Vases 2,980 ft., Ste. Genevieve 3,026 ft., Rosiclare 3,033 ft., McClosky 3,056-61 ft., T.D. 3,101 ft.

Saline County

Wildcat: Potter et al 1 Thaxton, E½ NW SW 28-8s-7e. dry, Waltersburg 1,805 ft., Tar Springs 1,815 ft., Glen Dean 1,845 ft., Cypress 2,201 ft., 15-qt. shot 2,212-17 ft., water.

Wabash County

Mount Carmel pool: Cameron 1 Utter, SW SE NW 17-1s-12w, pumped 21 bbl. oil and 6 bbl. water, 20-qt. shot, Cypress 2,025-38 ft., T.D. 2,054½ ft.

O'Meara 1 Smith, NE NE SW 17-1s-12w, pumped 60 bbl., 20-qt. shot, Cypress 2,050-64 ft., T.D. 2,077 ft.

East Keensburg pool: D. & H. Drlg. 3 Beall, SE SW NW 11-2s-13w, dry, Menard 1,896 ft., Glen Dean 2,137 ft., Cypress 2,364 ft., T.D. 2,570 ft.

Wildcat: J. W. Carter 1 Walters, SE SE NW 34-1s-13w, dry, Menard 1,829 ft., Tar Springs 1,991 ft., Golconda 2,169 ft., Cypress sand 2,321-27 ft., Renault 2,491 ft., Aux Vases 2,579-96 ft. (water), Ste. Genevieve 2,596 ft., T.D. 2,680 ft.

Washington County

Irvington pool: Magnolia 5 O. Rahn, NW NW NW 23-1s-1w, pumped 15 bbl. oil and 9 bbl. water, 6-qt. shot, Benoist 1,535-40 ft.

Wildcat: De Kalb 3 Hunleth, SW NE NW 29-3s-4w, pumped 165 bbl. oil and 55 bbl. water, perf. 1,028-34 ft., T.D. 1,186 ft.

Wayne County

West Enterprise pool: Pure 2 H. G. Garrison, W½ NE SW 36-2n-7e, pumped 41 bbl. oil and 19 bbl. water, 5,000 gal. acid, McClosky 3,060-62 ft., 3,096-98 ft., 2,965-70 ft., T.D. 3,105 ft.

Enterprise pool: Pure 1 C. Hostetter-B, W½ NW SE 29-2n-8e, flowed 327 bbl., 5,000 gal. acid McClosky, T.D. 3,110 ft.

Pure 2 S. Hasselman, E½ SW NE 29-2n-8e, dry, Glen Dean 2,478 ft., Ste. Genevieve 2,992 ft., Fredonia 3,037 ft., T.D. 3,113 ft.

Pure 2 W. S. Hubble-B, E½ NE NW 32-2n-8e, flowed 470 bbl., 5,000 gal. acid, McClosky 3,027-29 ft., T.D. 3,075 ft.

Pure 2 C. Johnson-A, E½ NW NE 8-1n-8e, pumped 130 bbl., 5,000 gal. acid, McClosky 3,082-89 ft., T.D. 3,100 ft.

White County

East Calvin pool: Magnolia 9 J. J. Bond, SW SE SW 8-4s-14w, pumped 30 bbl. oil and 20 bbl. water, 100-qt. shot 2,700-40 ft., Aux Vases 2,687-2,720 ft., Benoist 2,721-40 ft.

Pure 11 Potter, NE SW SW 9-4s-14w, pumped 227 bbl., 40-qt. shot, Aux Vases 2,833-49 ft.

Cherry & Kidd, 3 W. W. Gray-D, SE NW NE 17-4s-14w, pumped 121 bbl., 100-qt. shot, Benoist 2,696-2,714 ft.

North New Harmony pool: Magnolia 6 G. Cox, SW NE SE 27-4s-14w, pumped 113 bbl. oil and 14 bbl. water, Aux Vases 2,818-42 ft., T.D. 2,961 ft.

Sun 17 C. R. Greathouse, NW NW SE 33-4s-14w, pumped 250 bbl., 70-qt. shot 2,578-94 ft., Cypress sand 2,573-2,620 ft., 20-qt. shot 2,686-2,707 ft., Benoist 2,672-2,708 ft., T.D. 2,727 ft.

Superior 5 Greathouse, NW NE NE 4-5s-14w, pumped 225 bbl., 2 per cent water, 3,000 gal. acid, McClosky 2,893-97 ft., 2,904-06 ft., T.D. 2,920 ft.

West Irons pool: Tide Water 1 Shain, NE NW SE 23-6s-8e, dry, 15-qt. shot Cypress 2,766-89 ft., T.D. 2,790 ft.

Storms pool: Blackstock 2 Storms-B, NE SW NE 23-6s-9e, location abandoned.

Wildcat: Lavender & French 1 F. M. Hon, SE NW SW 33-3s-14w, pumped 250 bbl. oil and 528 bbl. water, 2,000 gal. acid, McClosky 2,905-08 ft. (perf.), T.D. 2,934 ft.

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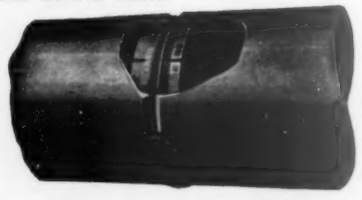

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McBride 2 F. M. Hon, NW SE SW 33-3s-14w, flowed 654 bbl., 500 gal. acid, McClosky 2,891-93 ft.
O. O. Borden 1 I. McCallister, NE SE NE 7-5s-14w, pumped 150 bbl., 30 per cent water, Aux Vases 2,887-2,911 ft.
H. V. Duncan 2 Henson, NW SW NE 23-6s-8e, location abandoned.

Kansas Fields

(Continued from Page 291)

pumped 12 bbl., Bartlesville 2,278-2,316 ft.
Blankenship pool: Progressive Oil 1-A Lose, C NW NE 22-26-8, pumped 35 bbl., pay 1,998-2,005 ft.

McPherson County

Bornholdt pool: Transwestern Oil 3 Nelson, WL NE NE 19-20-5w, flowed 65 bbl. an hr., Mississippi lime 3,313-54 ft.

Morris County

Nelson pool: Hutchinson O. & G. 1 McCoy, W½ NW SW 29-17-5, dry, T.D. 2,525 ft., Mississippi lime 2,291 ft., Hunton 2,521 ft.

Pratt County

Cunningham pool: Skelly 4 Maxedon, EL SE SE 25-27-11w, flowed 511 bbl., Lansing 3,419-80 ft.

Rice County

Wildcat: R. E. Hess 1 Cole, SE SE NE 31-20-6w, dry, T.D. 3,481 ft., Topeka 2,375 ft., Lansing 2,910 ft., conglomerate 3,378 ft., Mississippi lime 3,418 ft., show oil 3,440-3,420 ft
Cramm pool: McPherson Drlg. 1 Cramm, SW NW SE 15-19-9w, pumped 365 bbl., Arbuckle 3,218-28 ft.
Keesling pool: Bay Pet. 1 Keesling, S½ SE SW 3-20-9w, pumped 45 bbl., Arbuckle 3,209-24 ft.
Wherry pool: Mid-Plains 5 Hauschild, S½ SE NE 15-21-7w, dry, T.D. 3,414 ft.

Russell County

Wildcat: Cities Service 1 Steinle, NE SW NW 36-14-12w, dry, T.D. 3,160 ft., Lansing 2,811 ft., Sooy 3,102 ft., Arbuckle 3,128 ft.
Coralena pool: Stanolind 11 Roesner, S½ SE SW 9-15-13w, pumped 349 bbl., Lansing 3,066-73 ft., T.D. 3,361 ft.
Hall-Gurney pool: Skelly 2 Hickey, S½ NW NW 30-14-13w, pumped 1,484 bbl., Lansing 2,881-83 ft., T.D. 2,906 ft.

Stafford County

Bedford pool: British-American 1 Meyer, NW NW NE 28-23-12w, 3,000 bbl., Arbuckle 3,825-35 ft.
Zenith pool: Landon et al 1 Volker, S½ SW SW 1-24-11w, flowed 778 bbl., Viola 3,713-65 ft.
Stanolind 1 Russell, WL NW SW 14-24-12w, dry, T.D. 3,886 ft., Viola 3,859 ft.
St. John pool: Atlantic Ref. B McNaghten, E½ E½ NW 27-24-13w, pumped 480 bbl., Arbuckle 4,051-64 ft.
Wildcat: Zephyr Drlg. 1 Moon, S½ SE NW 30-22-13w, dry, T.D. 3,927 ft., Topeka 3,010 ft., Lansing 3,473 ft., base Kansas City 3,740 ft., Viola 3,783 ft., Simpson 3,835 ft., Arbuckle 3,893 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo., Dec. 23.—Pioneer Drilling Co., headed by Robert McIntyre of Kansas City, Mo., brought in well No. 28 for the Falls City, Neb., pool the past week when 1 Boice, west offset to the discovery well of the pool came in for 300 to 350 bbl. in the Hunton lime. The well is in NE NW NE 18-1n-16e, elevation 900 ft. Hunton was topped at 2,259 ft.

R. L. Campbell 4 Schock in C SE SW 20-1n-16e, in the southwest part of the Falls City pool, was about to be drilled in. It found saturation when Hunton was topped at 2,278 ft. Bad weather delayed operations. Also to be drilled in soon was Skelly 4 Wallraff, 440 ft. from west line and 625 ft. from south line of NE SW 20-1n-16e. Hunton was topped at 2,210 ft.

Liberty Development Co. of St. Joseph, drilling a wildcat 2½ miles north of Falls City production—1 Fehr in NW SE 31-2n-16e—was drilling in Mississippi lime at 2,269 ft. In comparison to the Falls City structure, this appears to be running low. The wildcat, however, may or may not be on a structure north of the discovery pool. The new structure was tapped by Campbell & Taylor 1 Walmsley in C SW NW 8-1n-16e, but the well has been making much more water than oil.

The Indian Territory Illuminating Oil Co. had a dry hole at 1 Ege in NE SE 19-3n-16e, 1¾ miles southeast of Shubert and 1½ miles northwest of 1 Schaible-Kuttler producer drilled by the same company. No. 1 Ege topped Hunton at 2,615 ft. and cored to 2,651 ft. but found lime hard and tight and without shows. The well was plugged.

In the Kansas area of the basin Dan McLaughlin 1 Thorp in C NE NE 27-10s-20e, Leavenworth County, had 70,000 cu. ft. of gas at 1,359-60 ft. Eight-inch was set at 1,350 ft. and Mississippi lime was topped at 1,395 ft. Total depth was 1,507 ft. The test was shut down for 6-in. pipe.

MISSOURI

De Kalb County

Wildcat: American O. & G. 1 Thompson, C SW SW 30-58-31w, dry, T.D. 2,261 ft., Mississippi lime 1,110 ft. and 1,232 ft., Hunton 1,575 ft., Viola 1,915 ft., Simpson 2,126 ft., Arbuckle 2,156 ft.

Livingston County

Wildcat: Fred Jones 1 Kesler, SE SE NW 16-59-25w, dry, T.D. 604 ft.

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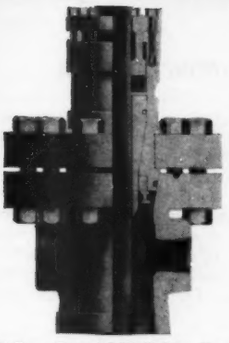

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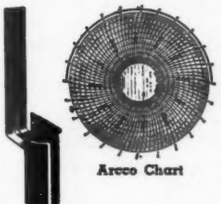

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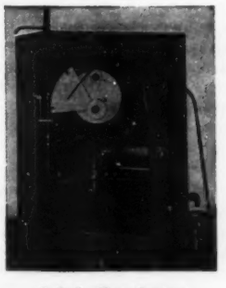

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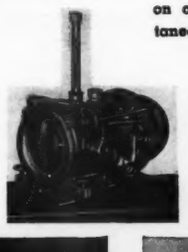

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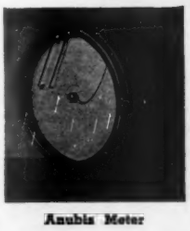

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Deep Lisbon Test Shows Gas In Smackover Lime

By GEORGE WEBER

SHREVEPORT, La., Dec. 23.—Union Producing Co. last week topped the Smackover lime in 1-A Meadows, a north outpost to the Lisbon field of Claiborne Parish. The deep well is reported to have shown gas in the oolitic member at the top of the formation. It encountered the lime at 10,270 ft., and the hole was carried to a total depth of 10,351 ft. where operators are conditioning mud to set casing, although the Meadows test is considered to be a disappointment generally, since sands encountered downdip on the Lisbon structure failed to show oil or gas. The test penetrated a coquina lime between 8,954 and 8,967 ft. showing oil, but the sands in the Cotton Valley formation which show production in Lisbon Exploration Co. 1 Vaughn, and J. D. Caruthers 1 Burgess-Simmons to the southwest, were pinched out against the structure.

The Caruthers test continued to flow gas and condensate last week, gaging 114 bbl. of 63-gravity condensate through a 26/64-in. choke with tubing pressure of 445 lb. and casing pressure of 950 lb. and a gas-oil ratio of approximately 16,000 cu. ft. per barrel. At Athens, Skelly and Sunray 1 Valentine also continued to test, making 49 bbl. of condensate and 6 bbl. of wash water per day through a 20/64-in. choke with tubing pressure of 1,800 lb. Tubing is set on a packer at 6,324 ft. and the well is making an estimated 4,000,000 cu. ft. of gas. Operators will continue to test it at the current producing level before deciding whether or not to plug back to other horizons showing for production.

SUMMARY OF COMPLETIONS

North Louisiana

	No.	Bbl.	Footage
Oil wells: Caddo	6	343	9,408
Sugar Creek	1	210	6,037
Olla	4	416	9,474
Gas wells: Monroe	1	8	2,200
Dry holes: Caddo	2	.....	4,348
Urania	1	.....	1,500
Wildcat	1	.....	3,013
Total	16	.....	35,987
Injection well: Bellevue	1	.....	417
East Texas Border			
Oil well: Smithland	1	36	2,365

Wilcox Play

The Wilcox play extending through central and southeastern Louisiana, continues strong, with leasing active throughout the area. Wildcats drilling in the area showed no new results last week, and two tests proved disappointing. In Caldwell County Gholson & Hodge 1 Louisiana Central was abandoned after showing an odor of oil and gas at 2,375-83 ft. in the Wilcox. The wildcat is located 9 miles northeast of the Olla field.

The Summerville field, to date productive of gas in one well, failed to show commercial oil this week, despite the show in Peterson Petroleum Co. 2 Tremont Lumber Co. The offset to discovery tested salt water in the 2,456-65-ft. sand and is shut down awaiting orders.

ARKANSAS

A blowout created interest in Arkansas, which has seen its quietest period in several years. In Union County Kinard, Curtis et al 1 W. L. Rowland, Rainbow field, blew out making an estimated 2,000,000 cu. ft. of gas and 1,500 bbl. of fluid daily. The fluid included 30 per cent oil. The blowout occurred when operators perforated casing at 2,748-50 ft. in the Blossom zone. It has been shut in and attempts will be made to complete it.

At McKamie, the first outpost test, Normandie Oil Corp. 1 Cornelius, located northeast of proven production, has encountered gas-condensate saturation in the Smackover and will probably extend the field.

EAST TEXAS BORDER

The J. D. Parson 1 Hook, 11 miles southwest of Jefferson in Marion County, East Texas, is reported running high. The wildcat is drilling below 3,815 ft., having topped the Woodbine at 3,530-40 ft. and the Georgetown at 3,571 ft.

A Shelby County wildcat, Superior Oil 4 Pickering, showed disappointing results on a drill-stem test at 5,653-70 ft. where a strong gas show had been encountered. The test recovered 720 ft. of salt water and a slight show of gas, and operators were preparing to set 5-in. casing to test the porous lime between 5,653-5,940 ft.

NORTH LOUISIANA COMPLETIONS

Bellevue—Bossier Parish

Tide Water 6 K. O. Lodwick Lumber Co. ..... SW SE 10-19-11
Injection well, 4½-in. 369 ft., T.D. 417 ft.

Caddo—Caddo Parish

Butler Prod. Co. 1 Williams.....NE NE NW 24-22-16
T.D. 2,648 ft., salt water.
Four Star Oil Co. 4 Muslow.....NE NE SE 5-20-15
Pumped 35 bbl., T.D. 1,520 ft., 6⅝-in. 1,380 ft., 3,000 gal. acid.
Gulf 9 Wadkins.....SW SW SE 22-21-15
218 bbl., 6-in. 1,421 ft., T.D. 1,596 ft., 4,000 gal. acid, chalk 1,421-1,585 ft.
A. R. Hancock 7 Helpman.....NE NE SW 16-21-16
T.D. 1,003 ft., pumped 10 bbl., 6⅝-in. 998 ft.
Juan & McFatrick 5 Hobbs ....SE NW NW 28-21-15
T.D. 1,700 ft., salt water.
Magnolia 31 Doan-Thigpen.....N½ NW NE 6-20-15
T.D. 1,505 ft., pumped 10 bbl., 4,000 gal. acid, 6⅝-in. 1,353 ft.
McDonald & Campbell 17 Youree NE SW NE 13-20-15
50 bbl., T.D. 2,272 ft., 6⅝-in. 2,269 ft.
Texas 2 Cullinan fee .....SE SW NW 32-21-15
Pumped 20 bbl. oil, 75 bbl. salt water, T.D. 1,512 ft., 5,000 gal. acid, 6⅝-in. 1,367 ft.

Wildcat—Caldwell Parish

Gholson & Hodge 1 La. Central.... NW NE 35-12-3e
T.D. 3,013 ft., dry, slight show gas 2,375-83 ft., asphaltic oil 2,945 ft.

Sugar Creek—Claiborne Parish

Union 2 Carter.....SW SW 33-20-5
T.D. 6,037 ft., 210 bbl., ¼-in. choke, T.P. 150 lb., C.P. 750 lb., sand 5,772-80 ft., 5½-in. 5,826 ft., perf. 5,770-83 ft., Travis Peak.

Olla—La Salle Parish

Arkansas Fuel Oil 1-C Kees.....SW NE 7-10-3e
100 bbl., pumping, 3 per cent salt water, T.D. 2,215 ft., 7-in. 2,215 ft., perf. 2,180-90 ft., upper Central sand.
Placid 77 La. Central.....SW SE 26-10-2e
96 bbl., ¼-in. choke, 5 per cent salt water, T.P. 340 lb., C.P. 680 lb., T.D. 2,400 ft., 7-in. 2,399 ft., perf. 2,224-28 ft., Mathews sand.
Placid 78 La. Central .....SE NW 24-10-2e
100 bbl., heading, 2 per cent salt water, open tubing, C.P. 250 lb., T.D. 2,398 ft., 7-in. 2,396 ft., perf. 2,222-30 ft., Cruse sand.
Placid 79 La. Central .....SW NW 24-10-2e
120 bbl., ¼-in. choke, T.P. 180 lb., C.P. 600 lb., T.D. 2,461 ft., 7-in. 2,407 ft., perf. 2,346-48 ft., Goodpine sand.

Urania—La Salle Parish

Fred Stovall 1 Russell..... 25-10-1e
T.D. 1,500 ft., salt water.

Monroe—Ouachita Parish

Carbons Consolidated 2 White..NW NW SE 34-19-3e
8,000,000 cu. ft. gas, R.P. 880 lb., 3,000 gal. acid, T.D. 2,200 ft., 6-in. 2,151 ft.

EAST TEXAS BORDER COMPLETIONS

Smithland—Marion County

Ray F. Shank 1 Borne & Livingston, James Coor Sur., pumped 36 bbl., 5½-in. at 2,365 ft., T.D. 2,380 ft.

Okfuskee County Wildcats Are Approaching Critical Stage

By ROBERT INGRAM

OPERATIONS this week were mostly of routine character while interest was centered on a number of wildcats in Okfuskee County which are due to be completed by year's end. This area has had the heaviest play of the state during the past few months.

Meantime, J. R. Higgins et al brought in another producer in the new East Cromwell pool of Okfuskee County at their 2 Berryman, SW SW SW 25-11-8e. The well flowed 40 bbl. of oil free from water from the Cromwell sand at an approximate total depth of 3,400 ft. The test was drilled too deep at first and hit water, but a shutoff was completed.

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Oil wells: Cumberland	2	1,480	9,772
Hewitt	5	644	11,723
Coyle	1	60	4,949
Other fields	8	525	26,773
Gas wells: Fields	1	*8	4,042
Dry holes: Hewitt	1	.....	2,418
Coyle	1	.....	4,918
Other fields	1	.....	2,158
Wildcats	2	.....	6,957
Total	22	.....	.....
Recompletions: Coyle	2	1,776	.....
Other fields	5	213	.....

*Million cu. ft.

Texas 1 Randles, NE NW NW 8-11-10e, the company's third well in the Okemah sector of Okfuskee County, opened up the third producing horizon there in the Cromwell sand where it flowed 12 bbl. in 12 hours with an estimated 1,000,000 cu. ft. of gas. The test was drilled to a total depth of 3,735 ft. in the Hunton lime, then was plugged back to 3,650 ft. and perforated in the Cromwell.

The discovery well, Texas 1 Cowan, SW SW SW 5-11-10e, was completed in the Hunton lime, and the southwest offset to the discovery was completed as a gasser in the Gilcrease sand.

In Pawnee County, Alma Oil Co. 1 Hill, NW SW 1-21-5e, a wildcat test due east of Pawnee, flowed 250 bbl. a day and as much water from the Wilcox at 3,369 ft. The well was hailed as a discovery, although several abandoned producers are located in the immediate vicinity.

A deeper producing horizon and possibly a new field for Osage County was reported northwest of Sand Springs at Norbla Oil and Peters Petroleum 2-83 Osage, SW SW NE 29-20-11e. Originally completed in the Bartlesville sand at 1,953 ft., the well went deeper to get the Arbuckle lime at 2,426 ft., pay at 2,433-34 ft. On tests, it showed 15 to 20 bbl. an hour.

OKLAHOMA COMPLETIONS

Bryan-Marshall Counties

Cumberland pool: Pure 4 Little-100, NE NW SE 28-5s-7e, flowed 138 bbl. in 4½ hr., ¾-in. choke, first sand 4,756 ft., second sand 4,872 ft., T.D. 4,879 ft.
Pure 3 Little-100, SW NE 28-5s-7e, flowed 93 bbl. in 3 hr. through ⅞-in. choke, first sand 4,777 ft., second sand 4,883 ft., T.D. 4,893 ft.

Carter County

Hewitt field: Jones 2 Daugherty, NE SW SE 17-4s-2w, pumped 2 bbl. oil and 200 bbl. water, sandy shale 2,415-2,520 ft., T.D., set casing 2,415 ft., perf. 2,330-40 ft.
Batson 2 Williams, SW NE 20-4s-2w, old well drilled deeper from 1,933 ft. to 1,948 ft., T.D., pumped 116 bbl., 30-qt. shot, 1,914-36 ft.
Gibson 6 Griffin, SE NE SE 20-4s-2w, pumped 312 bbl., 80-qt. shot, 2,155-88 ft., sand 2,140-88 ft., T.D. 2,193 ft.
Turner 8 Stearns, SE SW SW 21-4s-2w, pumped 130 bbl., dropped to 75 bbl., set casing at 2,300 ft., perf. 2,205-40 ft., T.D. 2,345 ft.
Turner 4 Ward, SW NW NW 28-4s-2w, pumped 125 bbl., set casing at 2,350 ft., T.D. 2,395 ft.
Gibson 3 Lamb, SE NE NE 29-4s-2w, pumped 130 bbl. oil, 14 bbl. water, 80-qt. shot 2,220-63 ft., T.D. 2,270 ft., casing 2,204 ft.
Lamb 1 fee, NE NW 29-4s-2w, old well drilled from 2,324 to 2,418 ft., pumped 15 bbl. after 20-qt. shot at 2,308-28 ft.

Creek County

Mannford district: Irvin 1 Bailey, SE NE SE 1-18n-9e, lost hole in pink limestone at 2,153-58 ft., dry.

Hughes County

Wildcat: Feagin 1 Nicks, NE NW SW 8-9n-11e. Gil-

(Continued on Page 305)

East Premont and Luby Fields Get Major Extensions

By F. L. SINGLETON

CORPUS CHRISTI, Tex., Dec. 23.—Important extensions to the East Premont and Luby fields in Jim Wells and Nueces County were the highlights of development in the Southwest Texas district the past week. While development in proven fields is being maintained at a fairly steady pace, wildcatting throughout the district is at a low ebb and no material increase is anticipated until after the first of the year.

Magnolia Petroleum Co. marked up a major extension in the East Premont field, Jim Wells County, as preparations were made to complete 14 A. A. Seeligson after a drill-stem test recovered pipe-line oil. Sand and shale showing oil and gas was cored in the regular

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Laredo District			
Oil wells: Colorado	3	441	8,901
Other fields	7	650	21,369
Gas wells	1	.....	1,197
Dry holes: Fields	2	.....	3,564
Wildcats	2	.....	5,417
Total	15	.....	35,031
San Antonio District			
Oil wells	1	4	684
Dry holes	2	.....	3,279
Total	3	.....	3,963
Lower Gulf Coast			
Oil wells: Stratton	3	326	19,956
Other fields	2	278	10,611
Dry holes: Fields	1	.....	8,394
Wildcats	2	.....	9,518
Total	8	.....	48,479

Frio sand at intervals from 6,558-6,705 ft., and the well is being completed through perforated casing at 6,625-27 ft., where a drill-stem test flowed oil, and after the drill stem was broken down, 1,320 ft. was recovered. The well is located in the Los Jaboncillos grant, approximately 1 mile north of the company's 13 Seeligson. While East Premont was one of the first fields in the county to produce from the Frio sand, the structure is still in the early stage of development, and the present completion makes it one of the most important fields in the county.

Luby Field Extended

Further development on the east side of the Luby field is anticipated following the completion of Seaboard 1 Chapman which was completed for an initial production of 896,000 cu. ft. of gas and 30 bbl. of distillate per day flowing through a $\frac{7}{32}$-in. choke. Shut-in tubing pressure was 1,425 lb. and flowing pressure on the casing was 980 lb. This well was drilled to a total depth of 7,628 ft., and after logging only slight showings in the 5,300-ft. sand, the hole was plugged back and completed in the Catahoula formation at 4,023-27 ft. Location is in Section 78, Laureles Farm Tracts subdivision of the Chapman ranch, about 1 mile east of production.

F. A. Gillespie & Son 1 Dabney which opened a new gas-distillate area 2 miles east of Agua Dulce field, Nueces County, flowed 35 bbl. distillate per day through a ⅛-in. choke from perforated casing at 7,216-21 ft. Tubing pressure was 2,420 lb., and casing pressure 2,560 lb. In view of the recent oil strikes around the flanks of the Agua Dulce and Stratton gas-distillate fields, the completion of this well has attracted considerable attention and some interesting tests are expected to be drilled along this trend in the near future.

On the southeast flank of the Agua Dulce field, another producer was added to this newly opened oil area as Richardson Petroleum Co. 3 McCoy flowed 119 bbl. of 40.3-gravity oil per day through a 5/32-in. choke. Tubing pressure was 700 lb. and casing pressure 1,100 lb. The well is bottomed at 7,170 ft. and the completion was made by perforating casing at 7,430-36 ft. Location is in Share No. 2 about 3,000 ft. from the company's 2 McCoy.

Aransas Bay Producer

Gulfboard 1-239 State, located on the Mud Island prospect, offshore from Aransas County in Aransas Bay was reported to be showing for a producer at the close of the week as it flowed an unestimated amount of oil and wash water while cleaning out through a 5/32-in. choke. Tubing pressure was reported at 1,100 lb. The well is bottomed at a total depth of 9,257 ft. and is testing through perforated casing at 9,210-16 ft.

One of the largest deals reported in the district in several months was consummated during the week as Tom Graham of Corpus Christi sold his half interest in approximately 850 acres in the Reynolds and East Alice fields, Jim Wells County, to the Gulfshore Oil Co. for a consideration of approximately $1,300,000, part of which was in cash and the balance in oil payments. The deal included a half interest in 10 wells in the Reynolds field and 16 wells in the East Alice field.

Duck Bay Failure

An attempt to extend production in the Duck Bay field, Calhoun County, failed as Coronado Corp. 6 Welder was abandoned at a total depth of 6,098 ft. with no shows of oil or gas reported. The well is located about 1 mile north of the discovery well.

In Duval County Mudge Oil Co. 1 F. Gruy, approximately 1 mile west of the South Kohler field, Duval County, topped the Cole sand at 1,796 ft. and sand with a slight oil odor was cored to a total depth of 1,807 ft. A 20-minute drill-stem test of the section recovered 15 ft. of mud with no show of oil, and the well is drilling ahead in shale below 1,920 ft.

In Lee County Humble 1 Melde, northwest of the town of Giddings, L. P. Rucker Survey, topped Austin chalk at 5,803 ft. and at a total depth of 5,846 ft. the

(Continued on Page 305)

Third Test Puts West Bay on List of Producing Fields

By F. L. SINGLETON

NEW ORLEANS, La., Dec. 23.—The West Bay prospect, located near the mouth of the Mississippi River, southern Plaquemines Parish, was added to the list of producing fields in the Louisiana Gulf Coast district as Gulf Refining Co. 1 J. G. Timolat flowed 732 bbl. of pipe-line oil per day through a ¼-in. choke. Tubing pressure was 1,325 lb. and casing pressure 300 lb. The well is bottomed at a total depth of 7,286 ft. and is producing from oil sand topped in the Miocene at 7,270 ft. Nine and five-eighths inch casing was cemented at 7,263 ft. This structure was found by reflection seismograph shooting in 1938, and the present

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Oil wells: Fields	13	2,683	91,274
Dry holes: Fields	5	.....	33,589
Wildcats	2	.....	18,054
Total	20	2,683	142,917

well is located in 36-22s-30e, is the third test to be drilled, two other 10,000-ft. holes were abandoned in 1939 and in February of this year. The discovery well is reported to be several hundred feet structurally higher than the abandoned holes, and a field of major importance is believed to have been uncovered in view of the multiple sands that were logged by an electrical survey. These sands were logged at approximately 5,000 ft., 6,400 ft., 6,600 ft., 6,700 ft., and 7,000 ft. While none of these sands were drill-stem tested, it is reported that at least three of them are capable of producing.

Titanic Oil Co. 1 Marrero Land Co., a prospective pool opener in the Westwego area, Jefferson Parish, is bottomed at 8,325 ft., and plug is being drilled after cementing a protection string of 7⅝-in. casing, preparatory to drilling ahead to the 9,900-ft. sand from which the well blew out several weeks ago. The well made an unestimated amount of gas and distillate, but due to mechanical trouble it was necessary to plug back and redrill a new hole.

Bayou Blue Dome

On the Bayou Blue dome, Iberville Parish, Superior Oil Co. was attempting to complete 7 Schwing Lumber & Shingle Co. Casing was being cemented at 5,288 ft., and the well is to test the 5,000-ft. sand. Total depth of the hole is slightly below 5,300 ft. This dome is receiving an extensive drilling program as the result of new sand discoveries around the flanks of the structure, and several operations are listed for shallow production on top of the dome.

A revival of geophysical work in the Pine Prairie area, Evangeline Parish, is attracting attention and location for a Wilcox test may be announced in the near future. Since the opening of Wilcox production along this trend, Pine Prairie has been attractive looking and leasing around this old dome has been active with several major companies holding considerable protection acreage.

In the Lake Salvador field, St. Charles Parish, Texas Co. is preparing to test 3 State-Lake Salvador, approximately ¼ mile west of production. Casing was cemented below 10,000 ft. and the well is expected to test one of the two known producing sands at 9,800 and 10,000 ft.

Ville Platte Extended

An expansion of drilling activity in the southern part of the Ville Platte field, Evangeline Parish, is anticipated following the completion of Gulf 1 Vidrine which extend the Wilcox pay approximately 1,000 ft. The well is located south of Danciger 1 Pitre, the most southerly producer in the field and production was obtained by perforating casing in the Wilcox zone at 10,100 ft.

Humble Oil & Refining Co. is attempting to reestablish production at the Bayou De Glaize dome, Iberville Parish, as 7-in. casing was cemented below 8,900 ft. in 3-B Wilberts. This well is located a short distance northeast of the company's 2-B Wilberts which was completed in April for an initial production of 345 bbl. per day from sand at 8,648-57 ft. However, production was short lived, and the well was later abandoned after several attempts to revive production failed.

Water in South Crowley

Humble 2 Leger, completed several weeks ago to open a new producing sand in the South Crowley field, Acadia Parish, may be abandoned due to salt-water encroachment. The well was originally completed through perforated casing at 8,912-22 ft. for an initial production of 475 bbl. per day, but salt water has increased to 95 per cent. The perforations were squeezed and the company is preparing to test a shallow sand above 5,900 ft. Should the test fail, the hole will be abandoned.

In St. Bernard Parish, California Co. and Tide Water 1 Biloxi Marsh Lands Co. was attracting attention due to an attempted blowout at a total depth of 8,575 ft. The blowout stuck the drill stem and the progress of the well is temporarily delayed while the operators attempt to recover same. The well is located on what is known as the East Lake Borgne prospect in 25-12s-16e.

Hopes of opening a major extension to the Paradis

(Continued on Page 302)

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Among the Drilling

ALLEN & MORRIS, San Antonio, Tex., extended gas-distillate production in the Luby field, Nueces County, Texas, approximately 1 mile east with the completion of Seaboard Oil Co. 1 Chapman. In the Duck Bay field, Coronado Corp. 6 Welder, an outpost well, was abandoned, and the rotary is expected to be moved to a new location. In Jackson County, Texas, a new operation is being started for the Blutch Oil Co., while in the East White Point and Willamar field, two operations are reported to the W. R. R. Oil Co. and Pan American Production Co.

HELMERICH & PAYNE, Tulsa, was working to complete its 2 Sanders in NE NW NW 35-7s-4e, Franklin County, Illinois, in the McClosky lime last week. The well topped the McClosky at 3,103 ft. and was bottomed at 3,113 ft. Acidization with 1,000 gal. showed no results and the pipe was perforated at 3,072-75 ft.; testing of the well was being continued. The company's 1 P. M. Marvel, NW NW SW 36-7s-4e, was dry in the McClosky and was plugged back to 2,675 ft., where it showed water. These wells are in the Thompsonville area.

HARRY L. EDWARDS Drilling Co., Houston, Tex., is opening a new field on the Mud Island prospect, offshore from Aransas County, Texas, in Aransas Bay as Gulfboard Oil Co. 1-239 State is reported to be cleaning out, showing oil and wash water from perforated casing below 9,100 ft. Another producer was completed on the east side of the Esperson field, Liberty County, Texas, for W. P. Luse, and the rotary is slated to be moved to a new location. Drilling was started on three other tests located in the Abbeville, Dickinson, and West Ranch fields for Continental Oil Co., Pan American Production Co., and Midstates Oil Co.

HOUSH & THOMPSON, Houston, Tex., extended gas-distillate production in the Chocolate Bayou field, approximately 1 mile west with the completion of Phillips Petroleum Co. 1 Houston Farm Development Co., which is testing through perforated casing at 9,690-93 ft. Drilling continues at the Sorrento dome, Ascension Parish, coastal Louisiana, and at the Edgerly field, Calcasieu Parish, for William & King and the Gulf Refining Co.

GEORGE ECHOLS, Houston, Tex., is preparing to spud Titanic Oil Co. 1 J. F. Weed, an important south outpost test in the South China field, Jefferson County, Texas. In Iberville Parish, coastal Louisiana, and located on the St. Gabriel prospect, the company's 1 Natalbany Lumber Co. was spudded and shut down due to high water. In the Westwego area, a protection string of 7⅝-in. casing was cemented in Titanic Oil Co. 1 Marrero, a prospective pool opener located in Jefferson Parish, Louisiana.

CROSBY Drilling Co., Houston, Tex., cemented 5½-in. casing at 8,521 ft. in M. McMurray 1 Allen, a prospective pool opener in Lavaca County, Texas, but testing of the well has been delayed due to unfavorable weather conditions. Southwest of the Alta Loma field, Brazoria County, Texas, drilling was started on Strake Petroleum Co., Inc., 1 Griffith, a projected deep test located in the H. P. Cayce Survey.

GLOBE Drilling Co., Mount Pleasant, Mich., is moving in tools to drill Alfred R. Urion 1 Voss in Casco Township, Allegan County, Michigan. Location of the new test is in SW SW SW 35-1n-16w. Contractor last week was also awarded contract for drilling Urion 1 John H. Tripp in NE NE NE 4-1s-16w, in Geneva Township of Van Buren County, Michigan. In the Bloomingdale area of Van Buren County, Globe is moving in materials for Frank Gouin 2 Grant estate, in NE SE NE 15-1s-14w.

CHRISTIAN-CARPENTER Drilling Co., Houston, Tex., opened production from a new sand horizon in the southern part of the Ogburn field, Harris County, Texas, as the company's joint test with Joyce Richardson flowed 65 bbl. of fluid 10 per cent of which was salt water while testing through a ⅛-in. choke. Well was drilled to a total depth of 7,215 ft. and is testing through perforated casing at 6,448-51 ft.

NICKLOS Drilling Co., Houston, Tex., completed a second producer in the shallow Ritchie field, Acadia Parish, Louisiana, and drilling will probably be started on a second well in the near future. The well was drilled jointly with Vincent & Welch. In the Horseshoe Bayou field, St. Mary Parish, drilling was being started on another well for the Texas Co.

H. H. WEGENER of Dallas has been issued 32 permits to drill within the city of Benton in Franklin County, Illinois. There is no oil in the immediate vicinity of Benton, but

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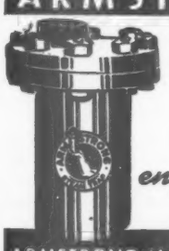

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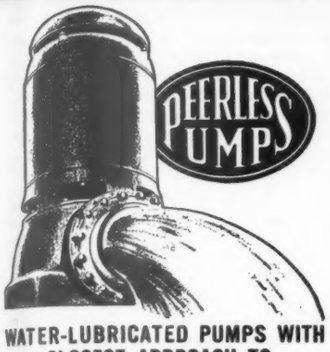

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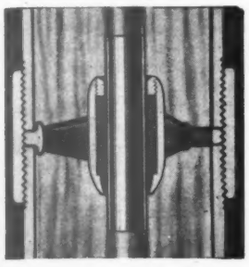

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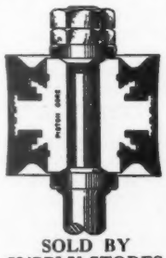

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FAIN-PORTER Drilling Co. of Oklahoma City, Okla., at its 1 Castle, NE NW SE 35-13-8e, near Mason in Okfuskee County, Oklahoma, was having trouble with stuck drill pipe late last week. Pipe was stuck at 4,000 ft. with the hole bottomed at 4,185 ft.

SIMPSON-ROODHOUSE Drilling Co., Tulsa, at its 1 Montpelier, SW NW 20-2-6e, West Fitts pool of Pontotoc County, Oklahoma, found the basal Oil Creek sand unproductive at a total depth of 4,513 ft. and was preparing to plug.

LUPHER Drilling Co., Mount Pleasant, Mich., last week was awarded contract for drilling Pure Oil Co. 1-A State-Freeman, in the Freeman area of Clare County, Michigan. Location is in C N½ SW NE 1-18n-6w. In the Broomfield Township of Isabella County, Lupher was drilling below 520 ft. at Pure Oil Co. 7-B Embrey in S½ S½ NW 4-14n-6w. In the Vernon area of the same county, contractor at last report was below 3,170 ft. at Nollem Oil Co. 6 Thayer. Location of this well is SE NW SE 22-16n-4w.

TED N. LAW, president of the Falcon Seaboard Drilling Co., Tulsa, last week made a flying trip through the Deep South to Miami, Fla. The company has six rigs scattered from the Gulf of Mexico in Galveston Bay to West Virginia. All but one, which is spudding in at Ville Platte, are drilling at around 9,000 ft.

TWIN Drilling Co., Grand Haven, Mich., has started drilling its 2 Barringer in NW SE NE 29-1s-16w, Geneva Township, Van Buren County, Michigan. Test is a west offset to its 1 Barringer, completed for a small producer. The 2 Barringer is expected to be carried to the Traverse lime if it should check favorably on the red rock.

FALCON-SEABOARD Drilling Co., Tulsa, reported drilling below 9,500 ft. on the Hope Natural Gas Co. 8517 Gribble in the Lost Creek sector of Harrison County, West Virginia. The test was originally scheduled for 7,500 ft., but has been seeking pay in the lower horizons. The company reports using 180 rock bits in the drilling of the well up to late last week.

TAYLOR Drilling Co., Centralia, Ill., and Hayden Campbell of St. Joseph, Mo., had a water problem on their hands last week. Their 1 Walmsley, just north of the Falls City, Nebraska, pool, was showing a high percentage of salt water.

HARRY H. SCHWARZ, St. Louis, Mo., is drilling below 3,500 ft. on the old Hughes Petroleum Co.'s 1 Schafly in 3-2n-3w, Carlyle pool of Illinois. This well was core-drilled to the Trenton lime and is now being deepened to test the St. Peter.

HINKLE Drilling Co., St. Elmo, Ill., has three wells going in 22-6n-5e, Effingham County, Illinois. Its 1-A Townsite ran a drill-stem test in the Benoist sand at 2,344-54 ft., 1-B Townsite was drilling and location was prepared for 1-C Townsite last week.

ZEPHYR Drilling Co., Tulsa, had one well testing and one drilling in the St. James pool in Fayette County, Illinois. Its 7 Stevens, NW NE SW 31-6n-3e, was testing on pump after a shot in the Cypress sand at 1,625-28 ft. Its 1 Owens, NW NE SE 31-6n-3e, was drilling.

PARKER Drilling Co., Houston, Tex., is moving a rotary 6 miles west of Sabine Pass in Jefferson County, Texas, where contract was received from Hall-Jordan Oil Co. for 2-271 State, located in the Gulf of Mexico.

WRIGHT Drilling Co., Houston, Tex., extended the West Ranch field, Jackson County, Texas, with the completion of Stewart Boyle 1 L. Ranch Co., located on the extreme east side of the field, and drilling is being started on another well. In the same county, 1 Mauritz, a wildcat 4 miles southeast of Gandado is rigging up and drilling was scheduled to get under way this week.

J. E. TRIGG, who is drilling a wildcat west of the old Red Bank field in Creek County, Oklahoma, was nearing the sand this week and expected to known on Christmas Day whether he had a producer or a dry hole. At last report the well, 1 Jennings in 18-16n-8e, was in shale at 3,600 ft. Shell Oil Co., Inc., and others also have an interest in the well.

JOHNSON & KEMNITZ have started making hole on the Gulf 1 Krieger, a wildcat in Stephens County, Oklahoma, south of the Knox field. The well is in E½ NE SW 3-2n-5w.

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Declining Exports Complicate Coastal Production Picture

By L. P. STOCKMAN

LOS ANGELES, Calif., Dec. 23. — Because of the inability of prospectors to discover new prolific fields during the past 18 months, the outlook appeared quite favorable a few months ago but recent developments have changed conditions. It now looks as though California marketers may lose about 35 per cent in offshore shipments of crude and refined oil to Japan as a result of the recent trade treaty between Japan and the Dutch East Indies. Coupled with this unfavorable condition is the probability that exports of crude and refined oil to British Columbia will be severely curtailed beginning January 1, 1941. Exports to British Columbia by Standard, Shell and Union have ranged from 6,000 bbl. to 8,000 bbl. per day, but recent developments indicate that exports during 1941 are expected to be reduced to about 2,500 bbl. daily. The Canadian attempt to prevent the outflow of gold and commercial credits is generally accepted as the reason for this reduction in exports from California.

Displacement of California oil by the preventing or limiting of imports may greatly increase gasoline prices in western Canada if present plans are carried out. The program is to use as much Alberta crude oil as possible and augment this with imports from Peru along with some California petroleum. The Alberta crude oil is of a very high gravity and consequently will not produce a very high recovery of refinery residuum and diesel. This would tend to indicate that some concession must be made to enable California marketers to import sufficient fuel oil and diesel to meet normal requirements. In the past, crude oil has entered Canada tax free but fuel oil, diesel and other refined products have been imported under a tax. This protective tariff was adopted to foster manufacturing in Canada. The question that now arises revolves around the possibility that California marketers may be allowed to import sufficient California crude oil to meet their respective refinery requirements in British Columbia. Standard Oil Co. and Shell Oil Co. each have a refinery in Vancouver, but Union Oil Co. is without adequate refining facilities. Heretofore Imperial Oil Co. has refined Union's California crude oil on a throughput basis but it is unknown at present whether Union can remain in British Columbia markets and operate with a margin of safety. This British Columbia condition is the result of a study of several years' duration and the first step was the action taken earlier in 1940 to set the retail price of gasoline in the province. The situation is further intensified because of the necessity of preventing the flight of gold and commercial credits. It may be possible that some concessions may be made after the new plan gets under way.

DAILY AVERAGE PRODUCTION
LEADING CALIFORNIA FIELDS

	Dec. 21	Dec. 14
Wilmington	82,950	83,125
Midway-Sunset	54,425	43,575
Long Beach	41,750	41,325
Kettleman North Dome	38,800	39,400
Coalinga	38,150	31,450
Ventura Avenue	33,525	34,225
Huntington Beach	26,400	26,850
Santa Fe Springs	25,150	25,425
Dominguez	21,250	21,025
Santa Maria Valley	18,750	19,450
Montebello	15,800	17,250

Midway-Sunset

The Vedder zone test that Honolulu Oil Corp. is drilling in the Buena Vista Hills section of the Midway-Sunset has reached a depth of 11,240 ft. and the company has been spot coring for the past 500 ft. and will continue to carefully watch the formation until the status of the well is decided. The Rio Bravo and Vedder, which may be the upper and lower Vedder, is expected around 12,000 ft., although the well will be carried down as long as conditions are favorable. The Stevens zone, which is productive in the Greeley, Canal, Canfield Ranch, Strand, Coles Levee, Tupman and Ten Section fields, was found barren in the Buena Vista Hills test. The deep-zone well of Honolulu is No. 25-P in 10-32s-24e, located in the same section in which Honolulu Oil Corp. drilled the discovery well in the Buena Vista Hills back in 1909. After a number of years, this 640 acres was awarded Honolulu Oil Corp. by right of discovery as a final adjudication of the problem resulting from the creation of Naval Reserves 1 and 2 and withdrawal of land by President Taft. Due to circulation trouble by one operator, wells in the Lake View section of the Midway-Sunset field of Kern County did not go on production this month until December 13. It has been customary for operators in this district to resume production on the first day of each month and then produce to capacity for a period of 15 days after which all wells are again closed down. Due to the delay in getting under way this month the operators will not suspend production again until December 28.

Coles Levee—Tupman

There are at present 16 strings of tools in operation in the Coles Levee and Tupman fields of Kern County and as a consequence about 10 should be finished during January 1941, provided normal progress is made. Of this group, Richfield Oil Corp. is drilling 12 wells and has derricks standing or locations staked for four more. The small number of derricks and locations tends to indicate the possibility that Richfield Oil Corp. may temporarily arrest its aggressive development program in these fields early in the new year. It is quite likely that the number of strings of tools that the company has kept in operation may be reduced. Richfield's development program adopted early last year contemplated completion of 50 wells during 1940 and a like number during 1941. Richfield achieved its first objective by completing exactly 50 wells in the Coles Levee and Tupman fields during 1940 and budgeted sufficient funds in 1940 to complete 50 wells during 1940 and 50 during 1941. This program fits in with Richfield's picture because that company was weak in reserves prior to its discovery of large production in the Tupman field. The necessity of developing substantial production in the Coles Levee and Tupman fields in Kern County reflects the fact that the company will lose several leases in the Elk Hills field due to expiration of the time element. These lands revert to the Navy Department and that department has announced that it will not consent to a renewal and will take possession when the time limit expires.

It has been the custom of the Navy Department to shut in properties acquired in the Elk Hills field and this group will be enlarged at the end of next year by several of Richfield's present productive leases. It has been intimated from time to time that action will eventually be taken to condemn all public land in the Elk Hills field and the field set up as a naval reserve free of drainage and outside influence. This is particularly interesting because Standard Oil Co. has started an outpost in the eastern end of the Hay section of the Elk Hills. This well is No. 42-31-S in 31-30s-24e and it is probably being drilled to determine a value in case anything is done along the line mentioned above. If the Elk Hills field contains production in the Stevens, Rio Bravo and Vedder zones of Miocene age it will form one of the largest reserves in the state; and likewise if Honolulu Oil Corp. finds the Rio Bravo and Vedder zones productive in the Buena Vista Hills section of the Midway-Sunset field the latter field will prove the largest future reserve. This is why so much interest is being shown in the drilling operations of Honolulu at Buena Vista Hills and Standard at Elk Hills.

LOS ANGELES BASIN

Inglewood

Standard Oil Co. made a series of formation tests this week on 3-1 Los Angeles Investment in the Inglewood field of Los Angeles Basin and all indications point to the probable completion of a good well in the Sentous zone of Miocene age. This well, which is an offset to 1 Sentous, a deep-zone well which R. R. Bush finished a few months ago, showed a flow of about 5,000,000 cu. ft. of gas on a 45-minute test at 8,524-90 ft. Present depth is 8,620 ft. and the crew is coring almost solid. R. R. Bush Oil Co., which proved up the existence of production in the Sentous zone on the south flank of the Inglewood structure, has taken over Federal 1 Smith, located up on the northwest plunge of the structure, and will attempt to recondition the hole and deepen it to the Sentous zone. No. 1 Smith is now down 7,883 ft. at which depth some mechanical trouble developed several months ago and resulted in a plug being put in bottom at 7,650 ft. All the above work is located around the edge of the Inglewood structure but it will obviously affect the entire structure if large production is developed. In the center of the Inglewood field, Standard Oil Co. made a formation test on 1-86 Los Angeles Investment at 3,765-3,840 ft. and with the valve open 44 minutes resulted in a recovery of 3,100 ft. of clean oil and another formation test at 3,665-3,775 ft. showed 3,540 ft. of clean 32.1-gravity oil. This well may possibly be completed in the upper zone, although with a 9-in. water string cemented at 3,428 ft. it can easily be deepened to the lower zone. Kettleman & Inglewood Corp. is completing 26 Rubel in the upper zone also and thus an aggressive deep-zone exploitation campaign may be averted or delayed.

Deep Wells

Union Oil Co. is leading the parade in Los Angeles Basin as far as deep drilling is concerned. In the Dominguez field Union's crew is drilling ahead in 79 Callender at 11,200 ft. and will go deeper inasmuch as the expected deeper zone below the eighth Callender zone has not yet been found. R. E. Havenstrite has apparently defined the western limits of production in the Dominguez field as 5 Larronde at 7,818 ft. in the eighth Callender zone definitely lacks fluid. Havenstrite extended the western limits of production in 1939 and the first four wells proved to be good producers. As a result of this move, Union Oil Co. acquired a lease on the Austin property located just north of the Larronde lease and has finished five excellent flowing wells to date and has another potential producer, 6 Austin, nearing completion. Union 79 Callender, present deep test, is the second deep well drilled by this company in an effort to prove up the existence of deeper production in the Dominguez field, and located in the west central part of the field. The company's first deep test was located in the east central part of the structure.

In the Santa Fe Springs field, Union Oil Co. has plugged back 100 Bell from 11,314 ft. to 7,943 ft. and has suspended work at the latter depth. This well was drilled a few years ago in compliance with lease requirements and while a productive zone was encountered near the bottom of the hole it apparently was not sufficiently productive to class the zone as being of a commercial nature. No. 100 Bell produced a small amount of crude oil for several months but early this year production ceased. It is very well located with respect to the Santa Fe Springs structure and its failure to show large flowing production tends to indicate that the zone at 11,314 ft. is not productive commercially. In the Long Beach field, Union Oil Co. is making hole in 19 Long Beach Community at 8,800 ft. and the projected completion depth is scheduled for 10,000 ft. provided the zone known to exist at that depth proves attractive. This well is being drilled because of lease requirements and while the De Soto zone at the above depth has not yet yielded a consistent flowing well the zone is good for about 250 bbl. per day on the beam or on a compressor. The crude oil is sweet and of a good grade and an average daily production of 250 bbl. represents a good investment provided the ultimate production is sufficient to recover drilling costs and provide a profit.

COASTAL DISTRICT

One of the most important wildcats being drilled in the coastal district at the present time is Tex Harvey Oil Co. 1 in the Huasna district of San Luis Obispo County. This wildcat, which is located in 11-32s-14e, is bottomed at 4,520 ft. and is being swabbed. The 7-in. water string has been cemented at 3,520 ft. and a good water shutoff was effected. The 1,000 ft. of formation open behind the liner has shown some promise although only a part of this interval is oil sand, the balance being shale. In the Ventura Avenue field, Lloyd Corp. 5 Lloyd, in the extreme eastern end of the Ventura Avenue structure, is still a disappointment and will be plugged back. This well is bottomed at 10,475 ft. and has 5-in. casing cemented at 10,440 ft. Early this week the 5-in. was gun-perforated at 9,930-10,130 ft. and at 8,520-8,650 ft. and swabbed in flowing salt water. This well has been tested at intervals from bottom to 8,520 ft. and in each case it showed salt water.

(Continued on Page 305)

Chocolate Bayou Production Extended One Mile West

By NEIL WILLIAMS

HOUSTON, Tex., Dec. 23.—While testing of M. McMurray 1 Allen, a prospective Wilcox pool opener in LaVaca County, awaited favorable weather conditions, interest in the Texas Gulf Coast district shifted to the Chocolate Bayou field, Brazoria County, where gas and distillate production was being extended approximately 1 mile west. The extension was made by Phillips 1 Houston Farm Development Co., which is cleaning out, flowing gas, distillate and wash water through a 7/8-in. choke. The well was drilled to a total depth of 10,006 ft., and is being tested through perforated casing at 9,690-93 ft. Tubing pressure was 1,800 lb., and casing pressure 2,825 lb. The completion of the well through present perforations would open a new horizon for the field. However, several sands are reported to have been logged, and these may be tested before the well is officially completed. The discovery well, 1 Andrau, was completed through perforated casing at 11,409-12 ft., while 1 Houston Farm Development Co., was completed in sand at 9,864-74 ft. Both of these wells were drilled by Glenn McCarthy for Phillips Petroleum Co., and very little information about sand conditions was released.

Stanolind 1 Burgess, a southeast extension well in the Rowan field, Brazoria County, flowed 218 bbl. of fluid per day through a 1/8-in. choke, of which 96 per cent was oil and 4 per cent was salt water. The showing of salt water apparently resulted in a mistake in measurements as a steel-line measure corrected the total depth from 8,549 to 8,554 ft., and the perforations at 8,537-47 ft. have been squeezed off preparatory to retesting.

Jackson County

An expansion of drilling activity on the east side of the West Ranch field, Jackson County, is anticipated following the completion of W. S. Boyle 1 L. Ranch, which was shut in due to high water after it had cleaned itself of wash water. This well recovered pipe-line oil in the 5,400-ft. sand, and was completed through perforated casing at 5,568-78 ft., where 3,270 ft. of oil was recovered on a drill-stem test.

Interest in Jackson County continued to be centered on the wildcat being drilled by Humble Oil & Refining Co. on the Egg lease, 7 miles northeast of LaWard in the Mauritz area. Broken sand and shale with a slight oil odor was cored during the week below 6,000 ft., and well is coring in sand below 6,505 ft. Sand with a show of oil was cored the previous week at 5,275-80 ft. Electrical surveys have been made of these sand sections but little information as to what they showed has been released.

Dyersdale Field

Salt water made its appearance in two recently completed wells in the Dyersdale field, Harris County, and both may be worked over. H. C. Cockburn 7 Burkett, approximately 1,000 ft. south of 3 Burkett, flowed an unestimated amount of fluid, 90 per cent of which was salt water and 10 per cent oil, while testing through a 1/8-in. choke. The well topped the sand section at 4,065-95 ft., and is testing through perforated casing at 4,073-77 ft., and 4,084-89 ft. The operator's 15 Burkett perforated casing at 4,064-74 ft. and the well flowed 160 bbl. of fluid, of which 6 per cent was salt water and the balance pipe-line oil. Tubing pressure was 200 lb. and casing pressure 400 lb.

Joyce Richardson 1-A Backen has apparently opened oil production from a new sand in the southern part of the Ogburn field, Harris County, as it flowed 65 bbl. of fluid per day, 90 per cent oil and 10 per cent salt water, through a 1/8-in. choke. Tubing pressure was 2,000 lb. and casing pressure 2,275 lb. Gravity of the oil tested 46°. This well is bottomed at 7,215 ft. and is testing through perforated casing at 6,448-51 ft. On the north side of the field L. M. Josey 1 fee squeezed perforations at 6,449-50 ft. and the operator is preparing to retest after another test at 6,616-19 ft. recovered salt water.

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Oil wells: Lolita	2	516	11,865
West Ranch	4	1,506	26,294
Other fields	12	3,768	81,129
Dry holes: Wildcat	1	.....	4,010
Total	19	.....	123,298

TEXAS GULF COAST COMPLETIONS

Brazoria County

Old Ocean field: Harrison & Abercrombie 1 Rimmer-Chenault, 277 bbl., 1/4-in. choke, top sand 9,980 ft., T.D. 10,175 ft.

Stanolind 1 Schelle-Schantz, 260 bbl., 12 hr., 1/4-in. choke, perf. casing 10,108-10,124 ft., and 10,134-10,142 ft., T.D. 10,875 ft.

Chambers County

Anahuac field: Gulf 16 Wilcox, 519 bbl., 1/4-in. choke, perf. casing 7,020-35 ft., T.D. 7,742 ft.

Harris County

Fairbanks field: Amerada et al 30 Foley, 148 bbl., 1/4-in. choke, top sand 6,823 ft., T.D. 6,849 ft.

Humble field: L. J. Sessions 1 T. W. Horn, 65 bbl., pumping, top sand 1,094 ft., T.D. 1,117 ft.

Jackson County

Lolita field: Humble 10-A L. Ranch, 456 bbl., 1/4-in. choke, sand 5,929-35 ft., T.D.

Magnolia 1 Hamilton, 66 bbl., 3/64-in. choke, perf. casing 5,928-30 ft., T.D. 5,932 ft.

West Ranch field: Humble 5 Vanderbilt-State, 575 bbl., 1/4-in. choke, T.D. 5,570 ft.

Magnolia 6 Turner, 230 bbl., 1/4-in. choke, perf. casing 5,760-68 ft., T.D. 5,764 ft.

Magnolia 117-A West, 573 bbl., 1/4-in. choke, perf. casing 5,113-19 ft., T.D. 5,124 ft.

Phillips 3 Simon, 128 bbl., 8 hr., 1/4-in. choke, perf. casing 5,750-54 ft., T.D. 5,826 ft.

Jefferson County

South China field: Titanic 1-C Guiterman, 212 bbl., 1/8-in. choke, top sand 7,501 ft., T.D. 7,564 ft.

(Continued on Page 305)

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Rocky Mountain Activity at Minimum as Year Ends

By T. R. INGRAM

DENVER, Colo., Dec. 23.—The completion of the year's drilling program in several of the Rocky Mountain fields, weather conditions, and the approach of the holiday season reduced active operations and completions to a minimum. There were no outstanding developments.

SUMMARY OF COMPLETIONS

Wyoming

	No.	Bbl.	Footage
Oil wells	1	2	845
Recompletions	1	299	.....
Montana			
Oil wells	3	257	7,499
Gas wells	3	*1.4	4,516
Total	6	.....	12,015
Recompletions	2	*2.0	.....

*Million cu. ft.

COLORADO

Huerfano County

I. E. Sideman-White 1 Martinez, C SW NE 33-26s-67w, La Veta district, reported abandoned last week on account of bad hole, skidded rig and 1-X Martinez is drilling at 1,467 ft. in new hole.

MONTANA

Fallon County

Montana-Dakota Utilities 144 Government, SW NE NW 25-8n-59e, Cedar Creek, was completed at 1,677 ft. for 395,000 cu. ft. of gas in 24 hours with a rock pressure of 445 lb. It produced through 267 ft. of perforated 4½-in. liner set on bottom.

Same company 146 Pat., NE SW NE 17-10n-58e, made 335,000 cu. ft. at 1,765 ft., total depth, from the Eagle sand at 1,470-1,765 ft.

Same company 69 Government, NE SE NE 2-7n-59e, was deepened from 830 ft. to 877 ft. and recompleted for 950,000 cu. ft.

Same company 70 Government, CNL SW NE 2-7n-59e, was deepened from 959 ft. to 985 ft. and recompleted for 1,080,000 cu. ft.

Glacier County

William Hanlon 3 Allotted-131, SW SE NE 7-32n-5w, Cut Bank field, swabbed 100 bbl. first 24 hours at 2,864 ft., total depth, from the Cut Bank sand at 2,825-58 ft. Main pay was at 2,847-57 ft. It will be shot.

Glacier Production 4 Scheuren, CNL NE SW 20-33n-5w, swabbed 52 bbl. first 16 hours at 2,996 ft., total depth, from sand at 2,956-96 ft. Main pay was at 2,991-96 ft.

Phillips County

Montana-Dakota Utilities No. 618, C SW SW 3-32n-33e, Bowdoin district, was completed at 1,074 ft. for 710,000 cu. ft. in 24 hours with a rock pressure of 264 lb. Bowdoin sand was at 791-900 ft. and Phillips sand at 1,000-30 ft.

Toole County

C. L. Mills 2 Government, SE NE SE 8-35n-2w, Kevin-Sunburst field, made 105 bbl. first 24 hours at 1,639 ft., total depth, after acidizing with 500 gal.

WYOMING

Carbon County

Sinclair-Wyoming Oil Co. 4-F Mahoney, C SW NE 34-26n-88w, is a new operation and has spudded with rotary tools with the Tensleep as the objective.

Natrona County

Iron Creek Oil 3 Government, CEL SW NW 11-32n-82w, Iron Creek district, was completed at 845 ft. for 2 bbl. of oil and 20 bbl. of water per day.

Niobrara County

Ohio Oil Co. 18 Lamb-Acct. 2, SE SW NE 5-35n-65w, reported a Lance Creek completion last week for 418 bbl., made 1,800 bbl. in 24 hours from the first and second benches of the Leo at 5,485 ft., total depth, on official gage.

Continental 23 Tom Bell, SE NW SW 34-36n-65w, swabbed only 21 bbl. in 24 hours after acidizing twice with 1,000 gal. at 5,355 ft., and is preparing to drill deeper.

Park County

Continental 2 Northern Pacific, NE NW NW 23-58n-98w, Frannie field, cored saturated Tensleep lime at 3,580-3,602 ft. and 3,614-15 ft., cemented 7-in. at 3,572 ft., and is preparing to complete.

Sweetwater County

Sinclair-Wyoming No. 78, SW SW NW 11-26n-90w, Lost Soldier, an old well deepened from 4,087 ft. in the Tensleep to 4,448 ft., was recompleted for 299 bbl. in 20 hours.

Weston County

W. H. Connor 1 State, NW SW NE 36-42n-61w, Dewey district, showed only ½ bbl. of oil in the Sundance at 951-82 ft. and is shut down for orders.

Louisiana Gulf Coast

(Continued from Page 297)

field, St. Charles Parish, was revived due to a blowout at W. P. Luse and J. P. McAdams 1 Peyregne, 2 miles south of the field. The blowout occurred at a total depth of 11,354 ft., and the operators are conditioning mud and trying to stop a strong salt-water flow. The well is several hundred feet structurally lower than the Paradis field and no showings of oil or gas were cored in the regular producing horizons.

LOUISIANA GULF COAST COMPLETIONS

Acadia Parish

Ritchie field: H. L. Carnahan 1-B R. McManus, 21-7s-1w, 42 bbl., 5/64-in. choke, top sand 3,510 ft., T.D. 3,525 ft.
Jennings field: Gulf 44 Arnaudet, 47-9s-2w, 392 bbl., ⅛-in. choke, perf. casing 7,574-84 ft., T.D. 7,585 ft.
South Crowley field: Humble 1 Freeland, 27-10s-1e, 76 bbl., ⅛-in. choke, perf. casing 7,093-97 ft., T.D. 9,029 ft.
Wildcat: Herton 1 Leonard, dry, T.D. 10,054 ft.

Ascension Parish

Sorrento field: F. O. Roshko 1 United Lands, 15-10s-4e, 10 bbl., 19/64-in. choke, perf. casing 4,376-95 ft., T.D. 4,448 ft.

Avoyelles Parish

Eola field: S. W. Richardson 1-D Haas Investment Co., 46-1s-2e, 324 bbl., ⅛-in. choke, perf. casing 8,540-55 ft., T.D. 8,580 ft.

Beauregard Parish

Neale field: Atlantic 4 Musser Davis Lumber Co., 23-3s-11w, temporarily abandoned, T.D. 8,501 ft.
Atlantic 1-C Rice Land & Lumber Co., 28-3s-11w, temporarily abandoned, T.D. 8,420 ft.

Calcasieu Parish

Iowa field: Shell 32 Heyd, 13-9s-7w, 356 bbl., ¼-in. choke, perf. casing 7,570-73 ft., T.D. 8,832 ft.
Sulphur field: Union Sulphur Co. 4 Ulrich, dry, T.D. 6,920 ft.

Cameron Parish

Chalkley field: Humble 12 Hanszen, 8-12s-6w, dry, T.D. 8,473 ft.
West Hackberry field: Stanolind 57 State, 16-12s-10w, 461 bbl., ⅛-in. choke, perf. casing 9,656-82 ft., T.D. 9,755 ft.

East Baton Rouge Parish

University field: William Helis 11 Nelson, 31-7s-1e, 245 bbl., 10/64-in. choke, perf. casing 6,741-75 ft., T.D. 6,794 ft.

Iberia Parish

Wildcat: F. K. Campbell 1 Gabriel Darby, 56-11s-6e, dry, T.D. 8,010 ft.
Jefferson Island field: Texas 4 State, 12s-5e, 66 bbl., ¼-in. choke, T.D. 3,075 ft.

La Fourche Parish

Rankos et al 1 Collins, 12-19s-22e, 118 bbl., 10/64-in. choke, T.D. 5,503 ft.

St. Martin Parish

Anse La Butte field: Stanolind 1-B J. J. Martin, 122-9s-5e, 16 bbl. oil and 64 bbl. salt water, ¼-in. choke, perf. casing 4,760-75 ft., T.D. 4,850 ft.
Happytown field: Shell 2 Iberville Land Co., 87-7s-8e, 324 bbl., 10/64-in. choke, perf. casing 9,947-52 ft., T.D. 10,903 ft.
West Lake Verret field: Shell 6 Jeanerette, 15-14s-12e, 25 bbl., 10/64-in. choke, perf. casing 6,965-73 ft., T.D. 8,985 ft.

Terrebonne Parish

Bay St. Elaine field: Jefferson Lake Sulphur Co. 6 Salt Dome Royalties, 8-22s-18e, dry, T.D. 1,275 ft.

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Prospecting for Oriskany Gas in West Virginia

By STAFF CORRESPONDENT

PITTSBURGH, Pa., Dec. 23.—The wildcat of Columbian Carbon Co. on the P. F. Riggs farm about ½ mile south of Odaville in Ravenswood district, Jackson County, West Virginia, was drilled through the Oriskany sand to 5,042 ft. and then shot. It tested 6,000,000 cu. ft. of gas a day which extends the possibilities of a new field as it is 3 miles from the nearest Oriskany test to the north. The Oriskany sand was topped at 4,936 ft. or 4,301.6 ft. subsea.

This company is drilling additional wildcats in this district, the one on the F. F. Starcher farm is drilling at 2,418 ft. and the other on the F. L. Roliff farm at 2,040 ft. In Ripley district the United Carbon Co. is drilling a wildcat on the B. B. Meadows farm which is down 3,986 ft. and which is remote from gas fields in Kanawha and southern Jackson counties.

During the past week in the lower eastern fields, 34 operations were completed of which 6 were dry, 27 gas wells, and 6 oil producers with an initial daily of only 1 bbl.

SOUTHWEST PENNSYLVANIA

A new Oriskany wildcat is starting in Southwest Pennsylvania, resulting from seismograph studies, located on the Elmer Pflug farm, New Sewickley Quadrangle, Beaver County, about midway between the tests on the Linnenbrink farm at Rochester and the Fanker in Butler County. It is about 12 miles NE of the Oriskany pool in South Beaver Township and starts at an elevation of about 1,120 ft. L. D. McMichael is the operator.

On Chestnut Ridge in South Union Township, Fayette County, Peoples Natural Gas Co. topped the Tully lime at 6,048 ft. in 3 Piedmont Coal Co. and is drilling at 6,474 ft. The Tully was bottomed at 6,171 ft. This company is spudding in No. 4 same lease. Here New Penn Development Co., William E. Snee, et al are drilling 3 Summit Hotel (Heyn) at 3,350 ft. In North Union Township, Wasson et al are drilling at 6,723 ft. in 2 J. H. Sorg.

Armstrong County

Boggs Township: John Wray et al 2 Ed Williamson, 150,000 cu. ft. gas, Murraysville, T.D. 1,296 ft.

Kiskiminitas Township: Peoples 1 J. S. Coulter, 24,000 cu. ft. gas, Bradford sand, T.D. 3,733 ft.

Fayette County

Menallen Township: George L. Yates 1 Penna R.R. Co., 1,100,000 cu. ft. gas, Injun sand, T.D. 1,140 ft.

Nicholson Township: Nollem 1 J. D. McCann, 2,500,000 cu. ft. gas, Big Injun sand 1,230 ft., gas 1,330 ft., T.D. Duquesne 1 Hattie Talbert, 70,000 cu. ft. gas, Fifth sand 2,334 ft., gas 2,336-38 ft., T.D. 2,377 ft.

Greene County

Monongahela Township: Johnson & Stephenson 1 Angelo Bruno, 210,000 cu. ft. gas, Big Injun sand 1,397 ft., gas 1,499-1,502 ft.

Richhill Township: Carnegie 2 Ella Sowers, dry, Injun sand, T.D. 2,245 ft.

Indiana County

Brush Valley Township: T. W. Phillips 1 M. J. and S. Overdorf, 219,000 cu. ft. of gas, Sheffield sand, T.D. 3,005 ft.

(Continued on next page)

Ogemaw County

West Branch Township: Weber Oil Co. 4 Estey, NE NE SW 28-22n-2e, 30 bbl., acid, T.D. 2,703 ft.

Ottawa County

Tallmadge Township: Swanson Consolidated Oil Co. 1-A Sutter, NE NE NE 33-7n-13w, 15 bbl., acid, T.D. 1,852 ft.

Smith Petroleum Co. 2 Fenske, SE SE NW 34-7n-13w, 4 bbl., acid, T.D. 1,897 ft.

Smith Petroleum Co. 5 Visser, SW NW NW 34-7n-13w, 30 bbl., acid, T.D. 1,793 ft.

Edward B. Strom 3 Zawadski, SE NW NW 34-7n-13w, 200 bbl., acid, T.D. 1,817 ft.

Saginaw County

Lakefield Township: Chartiers Oil Co. 1 Clark, NW NE SE 1-11n-1e, dry, T.D. 3,206 ft.

Van Buren County

Bloomingdale Township: Clapsaddle & Harris 2 Veley, NE N WNE 15-1s-14w, dry, T.D. 1,292 ft.

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Southwest Pennsylvania			
Gas wells	11	†5.2	23,413
Dry holes	4	.....	12,311
Total	15	.....	35,714
West Virginia			
Oil wells	1	*1	1,700
Gas wells:			
Oriskany	5	†19.8	25,399
Other	11	†9.8	24,999
Dry holes	2	.....	5,482
Total	19	.....	57,580

*Barrels. †Million cu. ft.

Oriskany production but which, if completed as a commercial gas well, would probably tie in with the main Oriskany

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Michigan Completions Fail To Stop Production Decline

By OTTO C. PRESSPRICH

SAGINAW, Mich., Dec. 23.—With November production the lowest for any month in the past 40, Michigan oil operators in the past week chalked up 16 completions, getting 9 producing wells with combined initial daily potential of 799 bbl., 3 of the wells rating 200 bbl. a day, including 1 in the Adams field of Arenac County, another in Ottawa's Tallmadge Township and the third in Allegan's Salem field. Three other Tallmadge completions were small producers.

Work preliminary to resumption of drilling on Gulf Refining Co. 1 Bateson deep test in Monitor Township, Bay County, consisted of foundation construction for the 136-ft. derrick expected in a few days. Gas pressure continues strong. The well burst into flame early in December in a spectacular fire that caused damage a revised estimate placed at $100,000.

Six new operations were scheduled, permits for tests in nine counties having been issued by the state Conservation Department. Van Buren led with four permits, Ottawa and Allegan getting three each. Muskegon, Gladwin, Kent, Calhoun, Gratiot, and Clare had one each.

November production totaled 1,273,500 bbl., compared to 1,468,222 bbl. in October as the number of wells increased from 2,951 to 2,974 and the daily average production decreased approximately 5,000 bbl. to 42,450 bbl. Biggest decline was 400 bbl. a day in the Walker-Wyoming field. Clare's Freeman-Redding field dropped 800 bbl., but remained the state's most prolific source of oil. Allegan and Van Buren counties also registered big declines.

W. L. McClanahan plans new development in Overisel Township, where he has leased a big block and where his 1 Campaigner wildcat in Section 11 was rated at about 150 bbl. a day, after acid. Producing from the Traverse at about 1,550 ft., the test was 2 miles north and east of the North Overisel pool.

American Drilling Co. 1 Cornwell ranch in Arthur Township, Clare County, was near completion point, drilling below 3,200 ft. and a few other wildcat tests in various sections of the basin areas were continuing.

SUMMARY OF COMPLETIONS

	No.	Bbl.	Footage
Oil wells:			
Ottawa County	4	249	7,359
Allegan County	2	300	2,945
Others	3	250	7,025
Dry holes:			
Allegan County	2	.....	3,045
Others	5	.....	11,332
Total	16	799	31,704

MICHIGAN COMPLETIONS

Allegan County

Overisel Township: H. C. Nelson 5 Kroeze, NE SE SW 9-4n-14w, dry, T.D. 1,490 ft.

C. W. Cook 1 Peters, SE NE NE 17-4n-19w, dry, T.D. 1,555 ft.

Salem Township: Michigan Devonian Petroleum Co. 2 Smith, NE SE NW 15-4n-13w, 200 bbl., acid, T.D. 1,585 ft.

Trowbridge Township: Miller Brothers 1 Foster, SE SW SW 16-1n-13w, 100 bbl., acid, T.D. 1,360 ft.

Arenac County

Adams Township: Pure Oil Co. 1 Ostroski, NW NE SE 22-19n-3e, dry, T.D. 3,009 ft.

United Drillers & Producers 2 Klein, NW SE SE 23-19n-3e, 200 bbl., acid, Traverse, T.D. 2,172 ft.

Gladwin County

Grout Township: Rowmor Corp. 1 Reynolds, E½ NE NW 23-18n-2w, dry, T.D. 3,825 ft.

Monroe County

Dundee Township: Consolidated Developers 1-B Bragg, SE NW SW 30-6s-6e, 20 bbl., shot, T.D. 2,180 ft.

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Warren County Scheduled To Get Wilcox Test

By GEORGE WEBER

JACKSON, Miss., Dec. 23.—New developments in western Mississippi and southwestern Alabama took interest this week, as current drilling activity in the state resulted in no important shows.

Leasing has taken a sharp upturn in western Hinds and eastern Warren counties, and an announcement is expected soon of development of a 4,000-acre block in Hinds County.

To the west on the Glass dome, Warren County, sector, a new test through the Wilcox formation is definitely scheduled, although no new locations have been made. The W. O. Allen test recently drilled through the formation checked 200 ft. high and as a result of the success in the Wilcox to the south and west in Central Louisiana, interest in another test to the formation is high.

Alabama

It is expected that Union Producing Co. will soon stake a second test in the Bladon Springs area, Choctaw County, Southwest Alabama. The company took over Joe Modisett 1 McCorvey and drilled it to a total depth of 9,626 ft. this year. The wildcat is reported to have had good shows of gas in the Tuscaloosa formation.

Alberta May Revise Allocation Methods

CHATHAM, Ont., Dec. 23.—Total Alberta production for 1940 is expected to reach, and possibly exceed, 8,200,000 bbl. compared with 7,584,411 bbl. for 1939, the previous record.

The Alberta Conservation Board has decided on a complete review of the methods of allocating crude production to Turner Valley limestone wells, to determine whether the production allotments are fair and equitable according to existing standards of ratable withdrawals and are effective in reasonably limiting surface and underground waste, preventing premature abandonment of wells, and encouraging maximum economic recovery. The present system, instituted in September 1938, gives equal weight in fixing quotas to four factors, acreage surrounding the producing well, reservoir pressure, gas-oil ratio and 1-in. choke flow. In the actual computation, the aggregate field quota is divided into four equal parts, each of which is then distributed to each participating well on the basis of that well's relation to the sum total of one or other of the basic factors. The sum of the four allocations fixes the well's sharing position.

Turner Valley Completions

North Turner Valley: Foothills Oil & Gas 7, LSD 4, 27-20-3w5, got the black lime at 8,578 ft. and finished at 8,588 ft. It drilled 605 ft. of lime. Liner has been cemented and the well is acidizing and testing.

West Central field: Arrow Royalties 2, LSD 15, 13-19-3w5, given temporary allowable of 325 bbl., tested 1,511 bbl. a day on 1-in. choke. Twin Valley Syndicate 1, LSD 9, made 1,447 bbl. and has been stepped up from 325 to 351 bbl.

Allied Royalties 1, LSD 16, 6-19-2w5, finished at 7,625 ft., has been reduced from 325 bbl. a day temporary allowable to 292 bbl.

Southwest field: Pacific Petroleums 4, LSD 3, 32-18-2w5, finished at 8,019 ft., gave 23 bbl. an hour after acidizing with 1,000 gal. in both upper and lower porous zones. Acidizing is being continued.

South Saskatchewan Test

Hon. W. F. Kerr, minister of natural resources for Saskatchewan, has announced launching of an exploratory project in southeastern Saskatchewan to cost more than $150,000. The undertaking follows an agreement between the provincial government and Norcanols Oil & Gas, Ltd. A geological survey will be started to cover 1,800 sq. miles, and preliminary work will also include testing by gravity meter and seismographic survey, to be followed by deep drilling. Operations will be financed by the Norcanols company, and an exploration and development campaign to last 2 or 3 years is planned.

Appalachian Fields

(Continued from preceding page)

T. W. Phillips 1 R. G. Campbell, dry, Bradford, T.D. 3,401 ft.

Center Township: T. W. Phillips 1 A. L. Light Coal Co., dry, Bradford sand, T.D. 3,358 ft.

Washington Township: T. W. Phillips 1 D. C. Bethel, 502,000 cu. ft. gas, Gordon sand, T.D. 1,735 ft.

T. W. Phillips 2 J. L. Jones, 152,000 cu. ft. gas, Gordon sand, T.D. 1,702 ft.

White Township: T. W. Phillips 1 R. & P. Coal Co., dry, Bradford sand, T.D. 3,307 ft.

Washington County

Amwell Township: Chivers et al 2 James Brister, 94,000 cu. ft. gas, Gantz sand and Fifty-foot 2,552-2,664 ft., gas 2,630-43 ft. and 2,652 ft., T.D. 2,691 ft.

Somerset Township: Equitable 1 D. A. Ripple, 189,000 cu. ft. gas, Bayard stray sand 2,792-2,818 ft., gas 2,795-97 ft., T.D. 2,902 ft.

WEST VIRGINIA

In Kanawha County Columbian Carbon Co. is drilling at 6,630 ft. in the test on the John Price farm in Poca district or 22 ft. in the Clinton sand which at present is void. Their test on the Copenhaver heirs has been cased with 5½-in. casing to 5,668½ ft. and is about to resume drilling. The Newburg here was 5,608 ft.

In Harrison County the deep rotary test on the C. S. Gribble farm in Grant district is drilling at 9,450 ft., or the record depth in the state.

Calhoun County

Lee district: Hope 8523 Hunter M. Bennett, 180,000 cu. ft. gas, Big lime 2,124-2,230 ft., Keener 2,230-48 ft., Big Injun 2,248-87 ft., gas 2,261-85 ft., T.D. 2,317 ft.

Sherman district: White Pine O. & G. Co. 2 Edna Ferguson, 300,000 cu. ft. gas, Big lime 1,971-2,041 ft., Keener 2,041-85 ft., Big Injun 2,085-2,123 ft., gas and oil show 2,093-2,116 ft., T.D. 2,123 ft.

P. P. Gunn et al 1 L. P. Fowler, dry, Big lime 2,044-2,147 ft., Big Injun 2,147-2,206 ft., gas show 2,198-2,206 ft., T.D. 2,220 ft.

Clay County

Buffalo district: Pittsburgh & West Va. 7774 Amanda A. Byrne, 1,107,000 cu. ft. gas, through Injun sand, T.D. 2,324 ft.

Monongalia County

Grant district: Owens, Libby-Owens 2 Luther Howell, 29,052 cu. ft. gas, Pittsburgh Coal 603-09 ft., Big Injun 2,049-59 ft., through Fifth, gas in Big Injun, T.D. 3,065 ft.

Logan County

Logan district: South Penn 60 Yawkey-Freeman, 556,000 cu. ft. gas, Berea, T.D. 2,878 ft.

Putnam County

Curry district: E. J. Elkins 2 G. G. Tallman, 7,020,000 cu. ft. gas before shot, Salt sand 1,140-1,540 ft., Big lime 1,648 ft., gas 1,703 ft., gas at 1,733-44 ft., T.D. 1,750 ft.

Ritchie County

Grant district: Kerns Farm Oil & Gas Co. 1 O. A. Kerns, 1 bbl., Injun sand, T.D. 1,700 ft.

Reno Oil Co. 1 W. D. McIntire, 75,000 cu. ft. gas, Keener sand, through Injun sand, T.D. 2,090 ft.

Murphy district: L. E. and W. H. Mosser 1 J. N. Goff, 161,000 cu. ft. gas, Injun sand, shot 1,910-22 ft., T.D. 1,954 ft.

Loris Swadley 1 S. Hardman, 53,000 cu. ft. gas, Injun sand, T.D. 1,750 ft.

Wayne County

Ceredo district: Hamilton Gas Co. 2 Shafer Bros., dry, T.D. 3,262 ft.

Union district: Industrial Gas Corp. 1 S. A. Booth, 116,000 cu. ft. gas, Big lime 1,186-1,360 ft., Big Injun 1,360-1,500 ft., Berea 2,002-27 ft., Brown shale 2,438-2,893 ft., shot 2,457-2,893 ft.

ORISKANY GAS FIELDS

Kanawha County

Poca district: United Fuel 4892 J. A. Wines, 622,000 cu. ft. gas before shot, Corniferous lime 4,901 ft., Oriskany 5,017 ft., T.D. 5,045 ft.

Godfrey L. Cabot 1 Mary A. Mason, 2,672,000 cu. ft. gas, Corniferous lime 4,853 ft., Oriskany 4,960 ft., T.D. 5,036 ft.

West Va. Gas 1 J. C. Legg, 2,363,000 cu. ft. gas, Corniferous lime 4,804 ft., Oriskany 4,923 ft., drilling 4,955 ft.

T. C. Matthews 1 Emily Higginbotham, 7,805,000 cu. ft. gas, Corniferous lime 4,851 ft., Oriskany 5,029 ft., T.D. 5,082 ft.

Big Sandy district: United Fuel 4983 M. D. Shafer, 223,000 cu. ft. gas, Big lime, T.D. 1,885 ft.

Jackson County

Ripley district: Godfrey L. Cabot 11 Putnam Co., 6,360,000 cu. ft. gas before shot, Corniferous lime 5,139-5,239 ft., Oriskany 5,239-81 ft., gas 5,242-51 ft., gas 5,264-68 ft., T.D. 5,281 ft.

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Second Hawkins Well Gets Pay 369 ft. Higher Than Discovery

By R. MARNE SANFORD

DALLAS, Tex., Dec. 23.—"Another Van field" was the trend of verbal speculation at the close of the week in Wood County when the second test in the area topped the Woodbine sand 369 ft. higher than the Manziel 1 Morrison, discovery, and was shut down to install a blowout preventer and cement 7-in. casing.

The new test to draw attention to the Hawkins area of Wood County is the J. Rotondi, Mount Pleasant, 1 Cobb heirs, George Brewer Survey, in Block 5 of the Hawkins townsite. After topping the Woodbine at 4,398 ft., some 369 ft. higher than the discovery well approximately 2½ miles to the north, the wildcat drilled 90 ft. of gas sand from 4,398 to 4,488 ft., shale break from 4,488 ft. to 4,490 ft. and oil sand from 4,490 ft. to 4,501 ft. A thin shale break was found from 4,501 to 4,505 ft., after which the main body of the Woodbine sand pay was logged from 4,505-4,602 ft., some 97 ft. of pay. Shale was found from 4,602 to 4,642 ft., total depth. At the close of the week the gas pressure had become so strong that, according to the rules of the Railroad Commission pertaining to townsite wells, drilling was halted to set 7-in. casing and install a blowout preventer. Contrary to the condition existing in the discovery well, no water has been found in drilling the 244-ft. section of Woodbine sand.

Meanwhile the original discovery well, Manziel 1 Morrison, is pumping at the rate of 20 bbl. of fluid hourly, about 25 per cent being water. Official gage is scheduled to start within a few days at the discovery well.

SUMMARY OF COMPLETIONS

Eastern Texas

	No.	Bbl.	Footage
Oil wells: East Texas	8	*290	28,779
Wortham field	1	†62	2,999
Dry holes: Wildcats	2	.....	7,605
Gas wells: Opelika field	2	‡283	15,958
Total	5	.....	55,341

*Barrels per hr. †Barrels. ‡Million cu. ft.

Limestone County

Two spots in Limestone County were indicating production from the deep Travis Peak formation at the close of the week. In the Kosse area in the extreme southern part of the county Dawes Harden and C. S. Amos 1 Hammond Ranch, 1½ miles northwest of the town of Kosse and in the J. Polk Survey, was preparing to test shows from the Travis Peak section of lower Trinity. The well was drilled to 5,955 ft. and 5½-in. casing was cemented at 5,858 ft. after electrical survey was made of the hole. The sand in the Travis Peak section, topped at 5,824 ft., showed good production possibilities and tests are scheduled to start the first of the coming week.

West of the town of Groesbeck in the Horn Hill area of Limestone County testing has started at the Farrell Drilling Co. and Gulf Oil Corp. 1 Frank Bevill, J. H. Murray Survey, a promising Travis Peak discovery well which has been shut down for the past 4 weeks due to title trouble on the operator's block. The test is bottomed at a total depth of 4,937 ft. with shows credited to the Travis Peak section topped at 4,982 ft. The plug was drilled and plans are to core below 4,937 ft. in search of further pay. Tests will be made the coming week of the section which has already shown production possibilities.

EAST TEXAS FIELD COMPLETIONS

Gregg County

Longview area: Cities Service 27 Jeter, 5 bbl. in 15 minutes, open tubing, 3,546-90 ft.
G. H. Vaughn 8 Jones, 30 bbl. in 30 minutes, open tubing, 3,544-49 ft.
Kilgore area: Hamil & Smith 7 M. Culp, 30 bbl., open tubing, 1 hr., 3,530-3,612 ft.
Hamil & Smith 6 M. P. Hughey, 60 bbl. in 3 hr., open tubing, 3,546-70 ft.
Hamil & Smith 8 J. A. Knowles, 30 bbl. in 2 hr., open tubing, 3,540-66 ft.
Hamil & Smith 4 Lacey, 45 bbl., 1 hr., open tubing, 3,534-70 ft.
Roosth & Genecov 3 Evans-Elder, 51 bbl. in 96 min., open tubing, 3,554-68 ft.

Smith County

Joiner area: Roosth & Genecov 2 W. R. Warford, 60 bbl. in 2 hr., open tubing, 3,752-54 ft.

EAST CENTRAL TEXAS COMPLETIONS

Freestone County

Wortham field: McNeil Pet. 1 Allmond, 62 bbl., 92 per cent water, 2,981-99 ft.

Henderson County

Opelika field: Lone Star 1 Allyn, 138,000,000 cu. ft. gas with est. 7,176 bbl. distillate, open flow, 7,930-78 ft.
Lone Star 1 Peacock, 145,000,000 cu. ft. gas with est. 7,540 bbl. distillate open flow, 7,935-80 ft.

Leon County

Wildcat: H. W. Hawker 1 C. A. Mills, M. Copeland Sur., 2½ mi. E Normangee, top Wilcox 1,010 ft., Midway 3,850 ft., dry at 4,365 ft.

Navarro County

Wildcat: J. R. Bunn 2 Cheney, J. White Sur., 3 mi. SE Navarro, dry at 3,240 ft.

Texas Gulf Coast

(Continued from Page 301)

Liberty County

Esperson field: General Crude 40-A Esperson, 551 bbl., ¼-in. choke, perf. casing 6,125-45 ft., 6,173-93 ft., T.D. 6,224 ft.
W. P. Luse 3 Hlavaty, 658 bbl., ¼-in. choke, perf. casing 6,424-90 ft., T.D. 6,521 ft.
Hardin field: Texas 4 Humphreys, 278 bbl., ¼-in. choke, top sand 7,615 ft., T.D. 7,634 ft.
Hull field: South Oil Corp. 2 Palmer, 79 bbl., 12 hr. ⅛-in. choke, top sand 3,117 ft., T.D. 3,179 ft.

Tyler County

Joe's Lake field: Republic 48 fee, 368 bbl., ¼-in. choke, top sand 7,680 ft., T.D. 7,710 ft.

Wharton County

Magnet field: Humble 30 H. C. Cockburn 93 bbl., ⅛-in. choke, top sand 5,529 ft., T.D. 5,539 ft.
Wildcat: Texas 1 Wyer, dry, T.D. 4,010 ft.

Southwest Texas Fields

(Continued from Page 297)

well was shut down to condition mud as the company began to lose returns. This is a projected Wilcox test.

SOUTHWEST TEXAS COMPLETIONS

LOWER GULF COAST DISTRICT

Calhoun County

Wildcat: Ray Ranger 1 Stutzenbecker, dry, T.D. 6,515 ft.

Karnes County

Wildcat: H. J. Baker 1 Ruckman, dry, T.D. 3,003 ft.

Nueces County

East Flour Bluff field: Humble 3-E State, dry, T.D. 8,394 ft.
South Clara Driscoll field: Magnolia 6 Johnson, 120 bbl., ⅛-in. choke, perf. casing 5,115-17 ft., T.D. 5,118 ft.
Stratton field: Bay-Tex Oil Corp. 3 Union Central Life Insurance Co., 170 bbl., ⅛-in. choke, perf. casing 6,695-6,700½ ft., T.D. 6,800 ft.
Conroe Drilling Co. 1-B Sellers, 108 bbl., ⅛-in. choke, perf. casing 6,451-61 ft., T.D. 6,475 ft.
Southern Minerals Corp. 3 Sellers, 48 bbl., 1/16-in. choke, perf. casing 6,656-64 ft., T.D. 6,681 ft.

Victoria County

Heyser field: Gulf 46-B Traylor, 158 bbl., ⅛-in. choke, sand 5,478-93 ft., T.D.

LAREDO DISTRICT

Duval County

Cedro Hill field: Magnolia 18 Duval County Ranch Co., 25 bbl., ⅜-in. choke, sand 1,456-60 ft., T.D.
Labbe field: W. C. Butler 1 Labbe, 123 bbl., ¼-in. choke, T.D. 2,897 ft.

Jim Hogg County

Colorado field: Humble 1-B King, 163 bbl., ⅛-in. choke, sand 2,955-69 ft., T.D.
V. F. Neuhaus 3-C Trevino, 175 bbl., ¼-in. choke, sand 2,981-89 ft., T.D.
Sun 13 Thaxton, 103 bbl., ⅛-in. choke, sand 2,939-43 ft., T.D.
Kelsey field: Humble 73 McGill, 173 bbl., 9/64-in. choke, sand 4,719-34 ft., T.D.
Manila field: Bridwell Oil Co. 1 Allen, 80 bbl. oil and 32 bbl. salt water, pumping, sand 2,650-62 ft., T.D.

Live Oak County

Oakville field: Henderson Coquat 1 Marrs McLean, dry, T.D. 3,569 ft.

McMullen County

Calliham field: Marion Production Co. 8-A Clark, 4 bbl., pumping, sand 1,027-31 ft., T.D.
South Calliham field: Edwin M. Jones 99 Ezzell, gas well, perf. casing 1,189-94 ft., T.D. 1,197 ft.
Morris Drilling Co. 5 Meier, dry, T.D. 58 ft.

Starr County

Boyle field: Barsodi 3 Vela, 48 bbl., pumping, perf. casing 3,234-48 ft., T.D. 3,705 ft.
Sun field: Sun 6-A Montalvo, 197 bbl., ⅛-in. choke, perf. casing 4,860-63 ft., T.D. 4,880 ft.

SAN ANTONIO DISTRICT

Caldwell County

Bee Creek field: Ralph Ogden 6-A Miears, dry, T.D. 2,321 ft.

Milam County

Minerva-Rockdale field: McCormick 2 Robinson, 4 bbl., pumping, T.D. 684 ft.

Williamson County

Thrall field: Magnolia 73 Stiles, dry, T.D. 958 ft.

Oklahoma Fields

(Continued from Page 296)

crease 2,431 ft., H.F.W. 2,470-80 ft., Cromwell 2,007-17 ft., dry.

Jackson County

Altus pool: Gulf 7 Barrett, NW NW 10-1n-20w, pumped 10 bbl., casing 1,393 ft., P.B. from 1,598 ft. to 1,568 ft.

Logan County

Langston pool: Amerada-Stanolind 1 Fouts, NW NE 14-17n-1w, old well P.B. from 5,246 ft. to 4,974 ft., pumped 25 bbl. in 24 hr., perf. 4,878-4,915 ft.
Texas 1 Smith, NE NW 14-17n-1w, old well P.B. from 5,131 ft. to 4,931 ft., pumped 50 bbl., perf. 4,895-4,919 ft.
Amerada-Stanolind 1 Knight, SW SW 12-17n-1w, old well P.B. from 5,100 ft. to 4,908 ft., flowed 7 bbl. oil and 2,000,000 cu. ft. gas.
Lovell pool: Danciger 1 Shore, C SW SE 34-18n-4w, flowed 30 bbl., Layton 4,876-4,903 ft., perf. 4,876-4,900 ft., T.D. 4,915 ft.
H-P Gas 2 Matheson, C SE SW 34-18n-4w, flowed 310 bbl. and 6,000,000 cu. ft. gas, casing 4,836 ft., Layton 4,820-67 ft., T.D. 4,873 ft.

Lincoln County

Prague pool: Berkey 3 Gragg, SE NE SE 32-12n-6e, pumped 30 bbl. oil and 20 bbl. water, casing 3,800 ft., P.B. from 3,312 ft. to 3,309 ft., T.D.
Laffoon pool: Warren 1 School, NE SW 16-13n-6e, 8,000,000 cu. ft. gas, casing 4,022 ft., T.D. 4,042 ft., Hunton 4,021 ft.
Davenport pool: Nagle 1 Robertson, SW SW 3-14n-6e, pumped 1 bbl., 40-qt. and 100-qt. shots 2,993 ft., P.B. from 3,201 ft. to 3,018 ft., T.D.

Payne County

Coyle pool: Texas 6 Minnich, W½ SE NE 11-17n-1e, flowed 60 bbl., casing 4,054 ft., first Wilcox 4,913-48 ft., 40-qt. shot 4,905-40 ft., T.D. 4,949 ft.
Texas 1 Bolster, W½ NE SE 12-17n-1e, old well P.B. from 4,885 ft. to 4,789 ft., dry.
Texas 3 Graham, W½ SE SW 12-17n-1e, old well P.B. from 4,896 ft. to 4,795 ft., perf. 4,587-4,617 ft., flowed 448 bbl. in 7 hr.
Helmerich & Payne 1 Freeman, NW SW 2-17n-2e, Wilcox 4,788 ft., T.D. 4,918 ft., dry.
Helmerich & Payne 1 Collins, E½ NW NW 13-17n-1e, old well P.B. from 4,896 ft. to 4,730 ft., flowed 240 bbl., ¼-in. choke, perf. 4,600-20 ft.
Wildcat: Roy Starr 1 School, W½ SW SW 16-20n-2e, Wilcox 4,940 ft., dry.

Pontotoc County

Beebe pool: Lake 6 Gray-B, SW NE SW 25-5n-4e, pumped 22 bbl., 3,000 gal. acid, Viola lime 2,470 ft., casing 2,490 ft., T.D. 2,570 ft.

Pottawatomie County

Gray pool: Vierson 2 Greenlee, SE SW SW 26-6n-4e, pumped 60 bbl., sand 2,952-65 ft., T.D. 2,966 ft., casing 2,952 ft.
St. Louis district: Andrade 1 Decker, SE NW SW 16-7n-4e, flowed 62 bbl., 50-qt. shot 3,538-54 ft., casing 3,534 ft., T.D. 3,554 ft.

California Fields

(Continued from Page 300)

In the meantime, Lloyd Corp. is continuing work on No. 6 which is down 8,630 ft. and being redrilled at 8,001 ft. All actual drilling is being done by Drilling & Exploration Co.

Texas Co. has shifted its attention to the coastal district in preference to the San Joaquin Valley or Los Angeles Basin and it is expected that other operators will do likewise early in 1941. The coastal district offers considerable inducement because of the fact that production is found at a shallower depth and therefore does not involve high development costs. In the Oxnard district of Ventura County, this company has recently spudded in 1 Montgomery in 13-2n-22w, and while drilling operations may result in reaching a depth of 7,000 ft., this is considerly shallower than many San Joaquin Valley fields. In the Goleta district of Santa Barbara County, Texas Co. has material on ground but will probably not be able to spud in for another 2 weeks due to heavy rains that have visited the district. This well, which will be designated as 2-A Bishop, will be drilled in 13-4n-29w and will be located in the same general area in which the company drilled a duster several months ago. No. 1 Bishop found top of the Vaqueros at 3,306 ft. and top of the Sespe at 3,760 ft., but both zones were found barren. The well was drilled to a depth of 4,350 ft. but failed to find an oil sand.

Personal Paragraphs

T. E. DeCILLIERS, resident chemist for Cities Service Oil Co. at its Ponca City, Okla., refinery, has been promoted to assistant chemist and transferred to the company's research laboratory at Okmulgee, Okla.

ROBERT M. BASS, formerly superintendent for Sinclair Prairie Oil Co. in the East Texas field, has resigned to enter the drilling-contractor business in East Texas. He will maintain headquarters at Kilgore, Tex.

FRANCIS M. FRASHER, president of Duval Oil Co., San Antonio, Tex., last week returned to that city after a 2 months' illness in New York.

LOUIS H. BROWN was the first employe to receive a dividend check from Shell Oil Co.'s pension plan. He was retired at 69 after 15 years of service with Shell.

CLAUD B. BARRETT, sales manager of the southern division, Texas Co., with headquarters at Houston, Tex., was elected president of the Houston Kiwanis Club last week.

BAKER HOSKINS, scout for the Shell Oil Co., Inc., with headquarters at Lake Charles, La., has returned to his territory after an absence of several weeks due to illness.

W. J. CHRISTIAN, chief administrative officer for the Texas Railroad Commission at Midland, Tex., has been transferred to Austin, Tex. The work at Midland has been taken over by S. ROSS CARR.

L. M. MOFFITT, secretary-treasurer of Triangle Drilling Co. and an official in other producing companies, Shreveport, La., has been named head of the group to sponsor the annual President's Birthday Ball in that city.

CHARLES N. WRIGHTER, of Kelvin, and LEE J. YEALEY of Shelby, independent oil producers of Montana, have been appointed to the Oil Conservation Board of Montana by GOV. ROY E. AYERS. Their terms will expire January 8, 1942.

HARRY KING has joined Continental Oil Co. in its land and scouting department and is stationed at Great Bend, Kans. Mr. King was formerly scout for Transwestern Oil Co. in Oklahoma and was president of the Oklahoma Oil Scouts Association. Scouts Association. He succeeds J. E. JULIEN, who has been transferred to Lafayette, La.

A. P. LOSKAMP, formerly in charge of Barnsdall Oil Co.'s West Texas district office at Midland, Tex., has resigned to assume new duties as district manager for the new office being opened in Midland by the Union Oil Co. of California. Mr. Loskamp had been with Barnsdall since 1926, going to Midland in 1928 as district geologist. J. D. McCLURE will be transferred to Midland from Michigan to take over the vacancy made by Mr. Loskamp. The new Union Oil Co. office will open on January 1, 1941.

L. A. GIBBONS, of Los Angeles, Calif., general counsel of Union Oil Co. of California, and BUELL F. JONES, of Chicago, general counsel of Stand-

L. A. GIBBONS *BUELL F. JONES*

ard Oil Co. (Indiana), have accepted membership on the American Petroleum Industries Committee, COL. HARRY T. KLEIN, chairman of the committee, has announced. Mr. Gibbons was graduated by Stanford University law school in 1927 and joined the legal department of Union in 1930. Mr. Jones served three terms as attorney general of South Dakota, and became associated with Standard of Indiana in 1930.

Washington Calls Texan

It's a long jump from Texas to the nation's capital into a position as one of the chief advisers on technical problems of motor fuel and lubricants. But when the National Defense Commission was casting about for a man to assist Dr. R. E.

PHILLIP M. ROBINSON

Wilson, head of the petroleum section, the qualifications of Phillip M. Robinson made him well suited for the task.

Mr. Robinson, chief engineer for the Pennzoil Co., Oil City, Pa., has been granted a leave of absence and he assumed his new duties at Washington, D. C., December 16. His new work will be in connection with the refining department of the industry. It will include surveys of the ability of the petroleum industry to manufacture suitable fuels and lubricants for the Army and Navy operations.

Mr. Robinson, one of the best known figures in refinery circles in the Pennsylvania region, is a native of Texas. He was born November 18, 1902, at Ector. A graduate of the University of Michigan, Mr. Robinson joined the Pennzoil Co. in 1929 as an assistant plant superintendent. In January 1931, he was placed in charge of the research and development department, and was later named chief engineer.

JOHN ROMER, vice president of the Socony-Vacuum Oil Co. with headquarters at New Rochelle, N. Y., was a visitor to the Texas Gulf Coast district the past week.

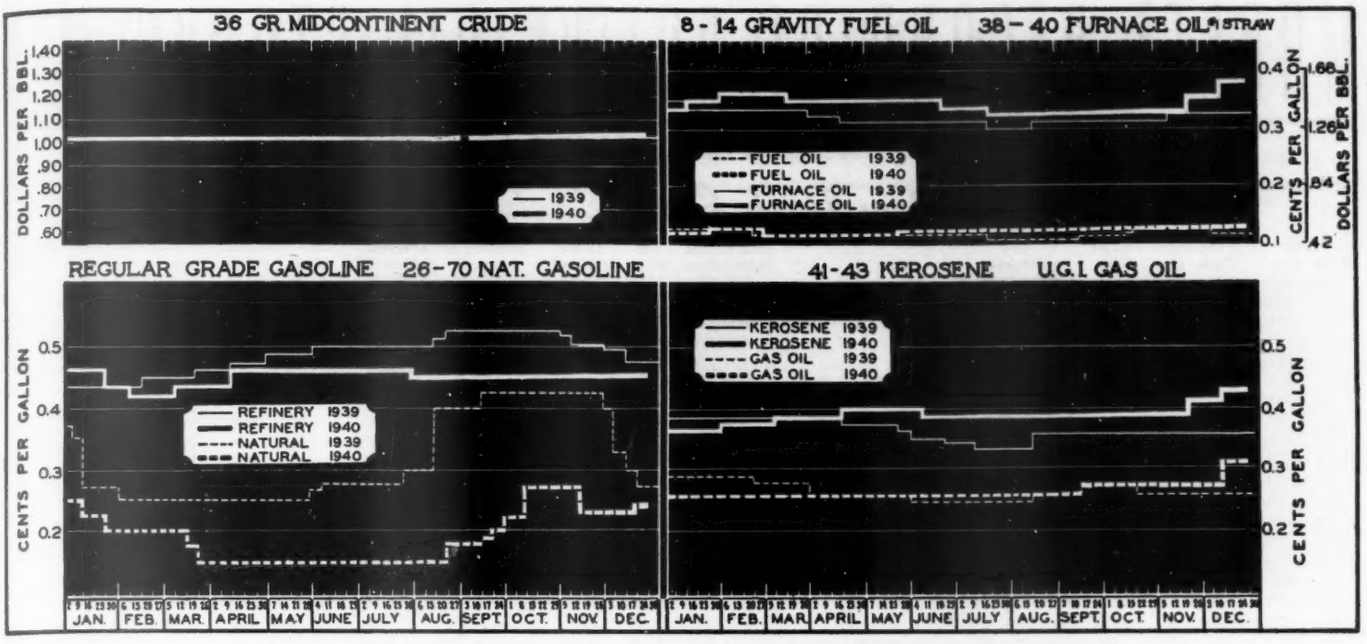
W. C. STOUT, who joined the Continental Oil Co. about a year ago, has been named superintendent of the land department of the Fort Worth, Tex., office to succeed the late F. D. Ballentine.

BARON J. C. VAN ECK, director of Royal Dutch-Shell, with offices in New York and London, arrived in Los Angeles, Calif., this week from the Dutch East Indies, where he participated in the trade agreement with Japan.

B. A. RAY, geologist with Tide Water Associated Oil Co., Midland, Tex., has been elected president of the Midland Geological Society. F. L. BATES, Texas Co., was elected vice president, and W. LLOYD HASELTINE, Magnolia Petroleum Co., was chosen secretary-treasurer.

GEORGE GODDARD, production manager for Cities Service Oil Co., is expected to return to the Bartlesville, Okla., offices about January 1 after spending several weeks in a Fort Madison, Iowa, hospital. He became ill and was taken from a train while en route to the annual A.P.I. meeting in Chicago.

NELSON H. DARTON, of Washington, D. C., has been named outstanding geologist of the nation for 1940 by the Geological Society of America. Dr. Darton, cartographer of the outstanding survey map of Lower California and whose field explorations have extended into more than half of the states of the United States and to Mexico, Venezuela, and Cuba, will be awarded the Penrose Medal at the society's annual meeting in Austin, Tex., December 26-28.



Representative Mid-Continent Quotations on Crude Oil and Refined Products, Basis Oklahoma (Group 3)

Gulf Market Softens as Other Parts of Country Trend to Firmer Prices

By H. STANLEY NORMAN

MARKET trends in the main producing and consuming centers of the country are in almost diametrically opposed disagreement this week. Fuel-oil prices are firm to higher in the Middle West, Atlantic seaboard and on the Pacific Coast while concessions below previous quotations were obtainable on firm offers in the Gulf Coast, primary source of supply.

Oklahoma natural-gasoline prices were advanced an eighth of a cent this week as the feature of an otherwise routine market in the Group 3 territory. The advance elevated quoted prices for 26-lb. natural in Oklahoma to 2⅝ cents per gallon for northern movement.

Lubricating Oils Firm

Neutral oils and 600 steam-refined cylinder oils are pushing higher in the western Pennsylvania district where refiners also boosted asking prices for kerosene. The trend to higher lubricating-oil prices is confined at this stage to the highs of the quoted range and applies only to the grades for which demand is greatest.

The Gulf Coast spot refinery market continued dormant with movement largely confined to material covered by contracts. Suppliers were more active in their search for business and this tendency reflected in the softening of prices asked in a few instances for kerosene, distillate fuel and for residual fuel. Residual fuel on the Gulf had been fairly firm until this week but buyers indicated material could be obtained for 75 cents per barrel which is 5 cents below previous lows. Distillate fuel meeting No. 2 burning-oil specifications is quoted by one large supplier at 3⅛ cents, down an eighth from prices asked earlier this month. Probably a majority of the Gulf refiners are still quoting 3¼ cents. Coastal refiners are offering kerosene at a range of 3⅝ to 3⅞ cents.

Market features of the week from the Gulf, East Coast and inland refining district are consolidated in this report. Separate reports for the important areas will be resumed in the January 2 issue. The A.P.I. weekly refinery statistical table will be resumed in the Market Section next week. Highlights of the stock changes appear on Page 59.

The East Coast refined-product market appears to be gaining strength at several points. Firming trend of the market has not been translated so far into higher prices. There is indication, however, that tank-wagon prices are working out from the frustration which has been characteristic for months. Highlight of the eastern market is the trend to higher lubricating-oil prices in the western Pennsylvania district. Consumption of lubricants by industry has been growing appreciably and the trend is pointing to much higher demand when the defense program reaches its majority, a development anticipated by midyear.

Refined Oil Market Barometer

MID-CONTINENT: Oklahoma natural-gasoline price advanced an eighth cent.

EAST COAST: Fuel oils bolstered on low side of market.

GULF COAST: Market dormant. Fuels turn softer.

PENNSYLVANIA: Gasoline firm and neutral demand increasing.

CALIFORNIA: Fuels active at steady prices.

CHICAGO: Large consumers of residual fuels seeking supplies.

Tanker rates for coastwise movement remained unchanged this week with a top of 80 cents per barrel, applying to clean boats for gasoline, kerosene and distillate fuel traffic. The market on dirty boats for residual-fuel movement is 65 cents. Two clean boats were chartered at 80 cents last week and one agreement carried a clause providing for a rate of 85 cents in the event discharge at Boston was ordered.

The Group 3 market had no features excepting the advance on natural gasoline. Motor fuel is moving at a rate abnormally high for the winter season. Demand for distillate burning oils is urgent from northern customers. Furnace-oil prices remain unchanged from recent weeks.

A French tanker, the 3,989-ton Merope, was reported chartered in Mexican trade at $4.25 per ton. This tanker was chartered for 4 months but the destination was not disclosed. Asked rates for Japan were raised to $17 per ton with the last paid reported at $15.

Tanker Recommendations

Results of an investigation by the U. S. Maritime Commission in the recent sharp inclination in tanker rates for coastwise service were announced. The report expressed the belief that an adequate supply of tonnage is available but urged that efforts be made to stabilize the rates and submitted several recommendations. These recommendations, directed both to tanker owners and to the oil industry, were: Better utilization of heating and fuel-oil stocks; elimination of as many long hauls as possible and retention of bottoms for coastwise in preference to foreign service; avoidance of the building up of unnecessarily large inventories at this time.

MARKET RECORD OF ACTIVE OIL STOCKS . . .

Compiled by Carl H. Pforzheimer & Co., 25 Broad Street, New York City, Member New York Stock Exchange and New York Curb Exchange

New York Stock Exchange

1940 High	1940 Low	Week ended Dec. 21 High	Week ended Dec. 21 Low	Week ended Dec. 21 Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1939	Com. sh. earn. 1939	Com. sh. earn. 1938	1939 High	1939 Low	1938 High	1938 Low
58½	38½	47½	44½	44½	Amerada Corp.	788,675	N.P.	50cQ	10-31-40	$2.00	$1.56	$2.07	74½	50	78	55
27⅛	18¼	24⅝	23⅞	24	Atlantic Refining	2,663,999	$25	25cQ	12-16-40	1.00	1.66	1.40	24¾	18⅜	27⅜	17¾
16⅝	8½	10½	9⅝	9⅝	Barber Asphalt Co.	390,223	$10	25c	5-21-40	.25	1.39	—.85	21	10¼	23¾	12⅛
13⅜	7⅛	8¾	8	8¼	Barnsdall Oil Co.	2,558,779	$5	15c	12-9-40	.90	.76	1.26	19½	11⅛	21⅜	10⅛
8⅛	5½	5⅞	5½	5¾	Consolidated Oil Corp.	13,751,726	N.P.	12½cQ	2-15-41	.80	.55	.55	9⅞	6½	10¾	7
25	16¼	19⅞	18⅜	18⅜	Continental Oil of Delaware	4,682,572	$5	25cQ	12-23-40	1.00	1.35	1.10	31½	19⅞	35¾	21¼
6⅞	3⅜	4⅛	3¾	3¾	Houston Oil	1,098,618	$25	....	10-17-30	....	.43	.83	9⅜	4½	9¾	5
14⅜	9	11¼	10¼	11	Lion Oil Refining	435,815	N.P.	25cQ	10-10-40	1.00	1.50	2.09	18⅛	10	25⅛	15⅝
17⅜	11½	14⅝	14	14	Mid-Continent Petroleum	1,857,912	$10	40c	12-2-40	.60	1.42	.56	18	11⅛	22⅝	12¼
11¾	7⅛	10⅜	9⅞	10¼	Mission Corporation	1,378,645	$10	25c	12-20-40	.65	.87	1.04	14⅞	8¾	17⅜	10⅝
9¾	4⅝	6½	5¾	6	National Supply	1,155,517	$10	....	12-22-37	...	—.87	—.79	15½	5⅝	23	12⅛
8¾	5⅜	7	6⅝	6¾	Ohio Oil Co.	6,563,377	N.P.	25c	12-14-40	...	—.10	.25	10½	6	14⅞	8⅞
8⅞	5½	6½	6⅛	6¼	Pacific Western Oil	1,000,000	N.P.	40c	12-19-39	.40	.81	1.22	11⅞	7	15⅞	10¼
10½	6¾	8¼	8¼	8¼	Pan American Pet. Trans.	4,702,945	$5	25c	12-21-40	....	1.10	.08	8¾	5	9¼	6¼
41¾	27⅛	41⅜	39½	39¾	Phillips Petroleum	4,449,052	N.P.	50cQ	11-30-40	2.00	2.21	2.03	46½	31¼	44⅜	27¼
22¾	15	17⅛	16¾	16¾	Plymouth Oil Co.	1,038,633	$5	25c‡	12-23-40	§1.40	2.38	2.59	24	17⅛	25⅝	15
11½	6¾	8⅜	7¾	7¾	Pure Oil Co.	3,982,031	N.P.	25c	12-20-40	.25	1.11	.38	11¾	6⅛	13½	8¼
9¼	5⅞	8½	8¼	8⅜	Richfield Oil Corp.	4,010,000	N.P.	50c	12-21-40	.50	.65	.51	10¼	6⅝	9⅞	5
20	11	13¼	12⅜	13¼	Seaboard Oil of Delaware	1,244,383	N.P.	25cQ	12-14-40	1.00	1.40	1.52	24⅜	15½	27½	15½
13⅛	7⅝	11⅜	10¼	10⅜	Shell Union Oil	13,070,625	N.P.	50c	12-20-40	.50	.77	.72	17¼	9⅞	18⅜	10
23¼	12¼	20⅜	20	20⅜	Skelly Oil	995,349	$15	50c	12-20-40	.75	1.99	2.27	29½	15½	34⅜	18½
12½	7⅛	8½	8⅛	8¼	Socony-Vacuum	31,206,071	$15	25cSA	9-16-40	.50	1.10	1.29	15⅛	10¼	16⅜	10⅜
26⅛	16¼	18⅞	17⅞	18⅛	Standard Oil of California	13,003,953	N.P.	25cQ	12-16-40	1.10	1.38	2.22	33⅝	24¼	34⅞	25⅛
29	20⅜	26⅛	25½	25⅞	Standard Oil (Indiana)	15,272,020	$25	50c†	12-16-40	1.25	2.23	1.82	30	22⅜	35½	24⅜
46½	29⅞	33¾	33	33½	Standard Oil of New Jersey	27,280,998	$25	75c†	12-16-40	1.25	3.26	2.86	53½	38	58⅜	39¾
65⅞	46¾	58	56	57½	Sun Oil	2,434,863	N.P.	25cQ	12-16-40	1.00	2.74	1.07	66	45¾	65⅛	45
2½	1⅛	1½	1⅜	1⅜	Superior Oil Corp.	1,388,979	$1	10c	12-28-40	....	.04	.24	3⅝	1⅜	4¼	1⅜
47⅝	33	39⅞	38⅝	39¼	Texas Corp.	10,876,139	$25	50cQ	1-2-41	2.00	3.02	2.13	50⅜	32½	49⅝	32⅝
4¼	2½	3¼	3	3⅛	Texas Gulf Producing Co.	888,147	N.P.	10c	12-14-40	.20	.69	.86	5¾	3¼	5⅞	2⅝
8⅝	5⅜	5⅞	5⅝	5¾	Texas Pacific Coal & Oil	888,236	$10	10c	12-2-40	.40	1.00	1.16	11⅜	7	12½	7
12	8¾	9¾	9½	9⅝	Tide Water Associated	6,371,827	$10	15c	12-2-40	.80	1.05	1.28	14¼	9½	15¾	10⅛
17½	12	12½	12⅛	12½	Union Oil Co. of California	4,666,270	$25	25c	11-10-40	1.05	1.25	1.47	19¾	15⅛	22½	17⅛
29⅞	22¾	28	27⅞	27⅞	Union Tank Car Co.	1,177,381	N.P.	45c	12-2-40	1.30	2.07	1.16	24¼	20⅛	23½	20
3⅝	1¾	1⅞	1¾	1¾	Wilcox Oil & Gas	470,768	$5	10c	2-15-40	....	.77	.52	4¼	2⅜	3½	1⅝

*Also 5 per cent in stock. †Includes extras. ‡Also 2 per cent in stock. §Also 4 per cent in stock. ‖Also 2½ per cent in stock. ¶Also 1½ per cent in stock. —Deficit.

New York Curb Exchange

1940 High	1940 Low	Week ended Dec. 21 High	Week ended Dec. 21 Low	Week ended Dec. 21 Close	Stocks—	Total shares outstanding	Par value	Latest dividend	Payable or last paid	Dividends paid in 1939	Com. sh. earn. 1939	Com. sh. earn. 1938	1939 High	1939 Low	1938 High	1938 Low
10¾	4½	7	5⅝	6⅞	American Republics Corp.	1,308,049	$10	25c	12-18-40	....	$0.14	—.22	11¾	5½	11¾	5
3¼	1⅜	1⅝	1⅜	1½	Bridgeport Machine Co.	263,700	N.P.	$1.25	12-30-37	....	—.95	—.14	7¼	2½	10¼	4⅞
43	28	39⅛	38	38	Buckeye Pipe Line Co.	200,000	$50	$1	12-14-40	$2.50	3.13	2.36	34¾	26½	39	22⅛
117	95	108	108	108	Chesebrough Mfg. Co.	120,000	$25	$1.50Q†	12-16-40	6.00	7.87	5.32	130	108⅝	128	97
6¾	4	5½	5	5⅛	Cities Service (new)	3,703,978	$10	....	6-1-32	....	.68	.23	9¼	4¼	11	5⅛
2⅛	1/16	⅝	⅝	1/16	Cosden Petroleum	465,332	$1	....	.....	....	....	....	2¼	½	2⅝	⅞
24¼	11⅝	13⅛	12⅜	12¾	Creole Petroleum	6,974,356	$5	50cSA†	12-16-40	1.00	1.38	1.64	28	16¾	27½	17⅛
4⅜	2⅞	3¾	3½	3¾	Darby Petroleum	351,390	$5	25cSA	1-15-39	.25	.03	.69	7⅛	3⅝	10¼	5½
2	⅞	⅞	⅞	⅞	Derby Oil & Refining	263,162	N.P.	....	.....	....	—.37	—.91	2⅝	1½	3½	1½
31	22	...	...	...	Eureka Pipe Line	50,000	$50	50c	11-1-40	2.00	.63	—.37	23	15⅛	31	16
39⅞	25⅛	32½	31⅛	31¾	Gulf Oil Corp.	9,076,202	$25	25cQ	12-27-40	2.00	1.69	1.43	45⅛	29¼	46⅞	33
68	47⅛	64	63⅜	63½	Humble Oil & Refining	8,987,840	N.P.	62½c	12-26-40	2.00	3.33	3.98	71	52½	72⅝	56
12⅜	5½	6	5½	5½	Imperial Oil of Canada	26,965,078	N.P.	25c	12-2-40	1.00	.71	.96	17	11⅜	19½	14⅛
7⅜	3	3¼	3¼	3¼	Indiana Pipe Line	300,000	$7.50	20c	11-15-40	.50	.33	.47	7¼	5½	9⅜	6
19⅜	8¼	9¼	8¾	9	International Petroleum	14,324,088	N.P.	50c	12-2-40	1.75	1.19	1.98	27½	17	31¼	21
2¾	1⅝	1¾	1⅝	1⅝	Kirby Petroleum Co.	500,000	$1	10c	4-15-38	....	.06	.14	3¾	2⅛	5	2⅛
10¾	7⅝	9½	9	9¼	Lone Star Gas	5,518,347	N.P.	30c	12-21-40	.70	.98	.88	10½	7⅛	10⅜	6⅝
6¼	3¾	4⅝	4⅛	4¼	Louisiana Land & Exp.	2,966,762	$1	5c	12-16-40	.35	.22	.45	7¾	4	9⅜	6½
17	9¼	...	...	...	Margay Oil Corp.	149,943	N.P.	25cQ	1-10-41	1.00	1.52	2.28	17	14½	24	16
8½	6½	7¾	7¼	7½	Midwest Oil Co.	998,474	$10	45c	12-16-40	.90	.99	.93	8¾	6⅝	9¾	6⅝
6¼	4⅞	5⅝	5⅛	5⅛	Mountain Producers	1,593,584	$10	30cSA	12-16-40	.60	.70	.62	6	4⅞	5¾	4½
13⅛	10	11⅛	10⅞	10⅞	National Fuel Gas	3,810,183	N.P.	25cQ	1-15-31	1.00	.95	.84	14	11¼	14⅝	11½
12½	8¾	10½	10¼	10⅜	National Transit	509,000	$12.50	50c	12-16-40	.95	.91	.88	9½	7¼	9¼	6½
1¼	¾	1	1	1	New Mexico and Arizona	1,000,000	$1	1c	12-1-37	....	.02	.02	1¾	1	2⅝	1½
7¾	5¼	6⅜	6¼	6¼	New York Transit	100,000	$5	25c	9-20-40	.40	.88	.16	6	4	4½	3½
9⅞	6	...	...	...	Northern Pipe Line	120,000	$10	40c	12-2-40	.30	.31	.24	7	4½	6	4
5½	2½	3¼	3	3¼	Pantepec Oil	2,856,872	$1	....	.....	....	....	....	7⅝	4	7¾	3½
3¼	1¼	1⅜	1¼	1¼	Root Petroleum Co.	336,045	$1	25c	2-1-37	....	.70	.17	5	1¼	4½	1⅝
3	1½	2⅜	2⅝	2⅝	Ryan Consolidated	298,931	N.P.	10c	12-28-40	....	.16	.29	3	1⅞	4	2⅛
11¾	4¾	8	7½	7½	Southern Pipe Line	100,000	$10	25c	9-3-40	.30	.25	—.27	4⅞	3½	5⅝	3¼
44	28	40	38	39½	South Penn Oil	1,000,000	$25	$1.87½†	12-20-40	3.00	2.84	1.44	40½	26¾	39	28⅜
35	21	...	...	...	Southwest Penna. Pipe Lines	35,000	$50	50c	12-26-40	2.00	2.06	—.41	23	18	22¼	16½
20⅞	16½	18⅞	18½	18⅝	Standard Oil of Kentucky	2,604,790	$10	55c†	12-16-40	1.30	1.53	1.45	20⅛	17¼	18⅜	15
41¾	26¼	36¾	35¼	35⅜	Standard Oil of Ohio	753,740	$25	$1.25†	12-14-40	1.50	6.64	1.81	32¾	17	22⅝	16¼
2	1⅜	1⅝	1½	1½	Sunray Oil	1,975,876	$1	5c	12-20-40	.10	.25	.23	2⅜	1⅜	3¼	2
3⅛	2	2¾	2¾	2¾	Texon Oil & Land	936,024	$2	10c	12-30-40	.10	.49	.56	4	2⅝	5¼	3½
3⅜	2	2¼	2	2¼	Transwestern Oil Co.	750,000	$10	....	.....	....	—1.42	.12	6	2½	5¼	2⅝
2⅛	¾	1/16	¾	1/16	United Gas Corp.	7,813,959	$1	....	....	...	—.55	—.51	3⅜	1½	5¼	2⅝

†Includes extras. —Deficit.

PRICES OF REFINED PRODUCTS...

All quotations f.o.b. plant in cars for interstate or export movement except as otherwise noted

Prices as of December 24, 1940

The quotations are exclusive of the federal excise taxes of 1 cent a gallon on gasoline and 4 cents a gallon on lubricating oils. Octane ratings in Middle West, Mid-Continent, and Southwest are based on A.S.T.M. method of testing.

Refinery Gasoline

OKLAHOMA (Group 3)—

U. S. Motor grades:		
72-74 octane (regular)	.04½	.04¾
63-66 octane	.04	.04¼
60 octane and below	.03¾	.04
60-62 400 grades:		
72-74 octane (regular)	.04½	.04¾
63-66 octane	.04¼	.04¾
60 octane and below	.03¾	.04

NORTH TEXAS—

U. S. Motor grades:		
72-74 octane (regular)	.04½	.04¾
63-66 octane	.04	.04¼
60 octane and below	.03¾	.04
60-62 400	.03¾	.04⅛

NORTH LOUISIANA (Ark. and N. La. delivery)—

U. S. Motor grades:		
72-74 octane (regular)	.04½	.04⅞
63-66 octane	.04¼	.04½
60 octane and below	.03⅞	.04⅛

ARKANSAS (Ark. and N. La. del.)—

U. S. Motor grades:		
72-74 octane (regular)		.04¾
60 octane and below		.04

CHICAGO (Based on Group 3)—

U. S. Motor grades:		
72-74 octane (regular)	.04½	.04⅞
63-66 octane	.04⅛	.04½
60 octane and below	.03¾	.04⅛
60-62 400 grades:		
72-74 octane (regular)	.04½	.04⅞
63-66 octane	.04⅛	.04½
60 octane and below	.03¾	.04⅛

PENNSYLVANIA (inland refineries)—

74-76 octane (regular)		.06
72-74 octane		.05¾

CALIFORNIA (domestic movement)—

88-80 400, 65 oct. and higher	.05½	.07¼
84-58 U. S. Motor	.04½	.06¼

EAST COAST (domestic)—

U. S. Motor grades:		
New York (Bayonne)*	.05½	.06½
Philadelphia	.06	.07
Boston	.05¾	.06¼
Baltimore	.05¾	.06¾
Charleston, S. C.	.05¾	.06½

*All grades of gasoline ⅛ to ¼ cent less for barge shipments. New York Harbor prices are for New York and New England delivery. Prices for New Jersey delivery ¼ cent lower.

GULF COAST (domestic)—

U. S. Motor grades:		
72-74 octane		.03½
70-72 octane	.03¼	.03½
68-70 octane		.03¼
65-67 octane	.03⅛	.03¼

Natural Gasoline

OKLAHOMA (Group 3)—

Grade 26-70		.02⅜
Grade 18-55	.02¾	.02⅞

NORTH TEXAS—

Grade 26-70		.02
Grade 18-55		.02⅜

CALIFORNIA—

75-85 375-390	.04½	.05¼

NORTH LOUISIANA (Ark. and N. La. delivery)—

Grade 26-70		.02

Tractor Fuel

OKLAHOMA (Group 3)—

40-42 gr., 315-325 l.b.p., 110-flash, 540-550 e.p.	.03½	.03⅝
41-43 gr., 300-320 l.b.p., 110-125 flash, 500-520 e.p.	.03⅝	.03¾
46-48 gr., 210-230 l.b.p., 480-max., e.p.	.03⅞	.04

Kerosene

(All kerosene water white)

OKLAHOMA (Group 3)—

42-44	.04⅛	.04¼
41-43	.04	.04⅛

NORTH TEXAS—

41-43	.03⅞	.04

NORTH LOUISIANA (Ark. and N. La. delivery)—

41-43	.03⅞	.04

ARKANSAS (Ark. and N. La. del.)—

41-43	.04	.04¼

PENNSYLVANIA (inland refineries)—

46	.05	.05⅜
45	.05	.05¼

CHICAGO (Based on Group 3)—

42-44	.04	.04¼
41-43	.03⅞	.04⅛

CALIFORNIA (Pac. Coast market)—

38-43 high burning test	.04½	.05½

NEW YORK (Bayonne, N. J.)—

41-43	.053	.055

GULF COAST (domestic)*—

41-43	.03⅝	.03⅞

*Barge price ⅛ cent lower.

Furnace Oil

OKLAHOMA (Group 3)—

Range oil	.03⅞	.04
No. 1 prime white, 38-42	.03¾	.03⅞
No. 1 straw, 38-40	.03⅝	.03¾
No. 2 straw, 32-36	.03½	.03¾
No. 3 zero to 10, 28-32	.03⅜	.03½

NORTH TEXAS—

No. 1 prime white, 38-42	.03⅝	.03¾
No. 1 straw, 38-40	.03½	.03⅝

NORTH LOUISIANA (Ark. and N. La. delivery)—

No. 2, 32-36	.03⅛	.03⅝

ARKANSAS (Ark. and N. La. del.)—

No. 2, 32-36	.03½	.03⅝

CHICAGO (Based on Group 3)—

Range oil	.03⅞	.04
No. 1 prime white, 38-40	.03¾	.03⅞
No. 2 straw, 32-36	.03½	.03¾
No. 3 zero to 15, 28-32	.03½	.03⅝

NEW YORK (Bayonne, N. J.)—

*No. 1	.053	.055
*No. 2	.047	.049
*No. 4	.047	.049

*Barge deliveries ⅛ to ¼ cent under above tank-car price.

Gas Oil and Fuel Oil

(Gas oil per gal., fuel oil per bbl.)

OKLAHOMA (Group 3)—

U.G.I. gas oil, under 35	.03½	.03¼
No. 5, low pour point, 18-22	.72½	.77½
No. 6, 15 and above, 8-14	.50	.55

NORTH TEXAS—

U.G.I. gas oil, under 35	.02¾	.02⅞
No. 5 low pour point, 18-22	.72½	.77½
No. 6, 15 and above, 8-14	.50	.55

NORTH LOUISIANA (Ark. and N. La. delivery)—

10-14 fuel oil, industrial		.70

CHICAGO (Based on Group 3)—

U.G.I. gas oil	.02¾	.03
No. 5, low pour point, 18-22	.75	.80
No. 5, 15 and above, 18-22	.60	.70
No. 6, low pour point, 10-16	.60	.70
No. 6, 15 and above, 10-16	.55	.60

PENNSYLVANIA (inland refineries)—

36-40	.04½	.05

CALIFORNIA—

Los Angeles:		
30-40 gas oil, per bbl.	1.10	1.25
24 plus diesel, per bbl.	1.10	1.25
24 plus diesel (bunkers)	1.20	1.35
12-16 (bunkers at tidewater)	.65	.75
10-16 (cargo lots)	.65	.75
12-17 (tank cars)	.60	.75
10-17 (high sulfur)	.50	.65
San Joaquin Valley:		
10-18 (tank cars)	.55	.70
24 plus diesel, per bbl.	1.10	1.25
San Francisco:		
24 plus diesel, per bbl.	1.35	1.40
24 plus diesel (bunkers)	1.40	1.50
10-16 (bunkers)	.75	.80

GULF COAST—

No. 2 fuel	.03½	.03⅝
43-47 diesel	.03¼	.03½
48-52 diesel	.03½	.03⅝
53-57 diesel	.03⅝	.03⅞
58-and-above diesel	.03⅞	.04
Diesel bunkers		1.50
Bunker C (bulk cargoes)	.75	.80
Bunker C (bunkers)		.80

NEW YORK (Bayonne, N. J.)—

27 plus, gas oil		.05
28-30 diesel (lighterage 6¼c per bbl.)		2.00
28-30 diesel (tank cars)	.047	.049
Bunker C (to ocean-going ships in N. Y. Harbor	1.15	1.25
Industrial fuel (tank cars)		.046

Lighterage charge 5c bbl. additional.

Bright and Steam Refined

OKLAHOMA (Group 3)—

200-210 D, 10-25		.18
150-160 D, 0-10		.13½
150-160 D, 10-25		.13
100-110 D, 0-10		.13
100-110 D, 10-25		.12½
Steam refined:		
600 dark green (untreated)		.07

PENNSYLVANIA—

Bright Stocks (Pennsylvania Grade No. 8 color, 140-150 at 210, 545-550 flash):		
10 pour point		.14½
15 pour point		.13½
25 pour point	.12	.13
Steam refined:		
600	.07½	.08
650	.08	.08½
600 flash	.09	.09½
630 flash	.11	.12

Neutral Oil

(Vis. at 100° F. except Pennsylvania and color N.G.A.)

OKLAHOMA (Group 3)—

0-10 pour point:		
150-3		.08
180-3		.08½
200-3		.08½
250-3		.10
280-3		.10½
280-4		.10
300-3½		.11
350-3½		.11½
400-3½		.12
500-3½		.12½
600-3½		.13
100-2½ paraffin oil, 10-25		.05¼
10-25 pour point:		
200-3		.08
250-3		.09½
280-3		.10
280-4		.09½

GULF COAST—

Pale oils:		
100-3	.05½	.05½
200-3	.07½	.07½
300-3	.07½	.07¾
500-3½	.08¼	.08½
750-3½	.08⅝	.08¾
1,200-3½	.08¾	.08⅞
2,000-4		.09
3,000-4		.10½
Red oils:		
200-5-6	.06⅞	.07
300-5-6	.07¼	.07½
500-5-6	.08	.08¼
750	.08⅝	.08½
1,200-5-6	.08½	.08⅝

CALIFORNIA (moving to dom. market)

Pale oils:		
100-2½-3	.07¼	.08
200-2½-3	.07¼	.08
300-2½-3	.07¼	.08
400-3-4	.07½	.08
450-3-4	.07¼	.08
550-3-4	.09	.11
600-3-4	.09	.11
Red oils:		
200-4-5	.07¼	.08
300-5-6	.07¼	.08
350-5-6	.09¼	.11½
400-5-6	.09¼	.11½
450-5-6	.09¼	.11½
500-5-6	.09¼	.11½
600-5-6½	.09¼	.11½
700-6½ plus	.09¼	.11½
750-6½ plus	.09¼	.11½
900-6½ plus	.09¼	.11½

PENNSYLVANIA—

150 vis., at 70° F., 3 color, 400-405 flash:		
Zero pour point		.22½
10 pour point		.21½
15 pour point		.20¾
25 pour point	.19	.20
200 vis., at 70° F., 3 color:		
Zero pour point		.24½
10 pour point		.23½
15 pour point		.22¾
25 pour point	.21	.22

Wax and Petrolatum

(Prices per pound)

OKLAHOMA (Group 3)—

124-126 (A.m.p.) w.c. scale	.02½	.02¾

PENNSYLVANIA (inland refineries)—

122-124 (A.m.p.) w.c. scale	.02½	.02⅞
124-126 (A.m.p.) w.c. scale	.02½	.02⅞

NEW YORK—

Wax in bags fully refined:		
125-127 (A.m.p.) wax		.0560
128-130 (A.m.p.) wax	.0560	.0570
130-132 (A.m.p.) wax		.0585
133-135 (A.m.p.) wax		.0615
135-137 (A.m.p.) wax		.0640
Crude scale:		
124-126 (A.m.p.) w.s.		.02⅞
124-126 (A.m.p.) y.s.		.02¾
Petrolatum in barrels, carload lots:		
Dark green	.02125	.02625
Amber	.02375	.02875
Extra amber	.02625	.03000
Lily white	.04375	.05125
Snow white	.05125	.06000
Cream	.03375	.04125

Export Prices

GASOLINE

GULF COAST—

U. S. Motor		.03⅝
60-62 400		.03¾
61-63 390	.03⅞	.04
64-66 375	.03⅞	.04

LOS ANGELES—

U. S. Motor grades:		
Above 69 octane	.05½	.05¾
65-69 octane	.05¼	.05½
60-65 octane	.04½	.05

KEROSENE

GULF COAST—

41-43 water white	.03⅝	.03¾

LOS ANGELES—

41-43 water white	.05	.05¼

LUBRICANTS

(Pennsylvania Grade)

NEW YORK (f.o.b. in bbl.)—

Cylinder stocks:	
600 S.R. unfiltered	.16
630 S.R. unfiltered	.17
600 flash, S.R.	.18
650 flash, S.R.	.20
Bright stock:	
Light, 25 pour point	.20½

NEUTRAL OIL

200-3 color	.27
150-3 color	.25½

PARAFFIN WAX

NEW YORK (prices per lb.)—

123-125 A.m.p.		.05600
125-127 A.m.p.		.05600
128-130 A.m.p.		.05850
133-135 A.m.p.		.06150
135-137 A.m.p.		.06400
Crude scale:		
124-126 w.s.	.02½	.02⅞
124-126 y.s.	.02½	.02⅞

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WILL take $7500.00 cash for ½ interest in 3000 acres oil leases and drilling well, half completed, good geology, on West Texas Structure, six formations to 3250 ft. depth. Address Owner, 610 Wilson Building, Dallas, Texas.

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FOR SALE: 12,000 acre block oil and gas leases in Eastern Wyoming. Write Box A-292, The Oil and Gas Journal, Tulsa, Oklahoma.

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Box A-267
The Oil and Gas Journal, Tulsa, Okla.

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You are looking for—If you need a salesman or contact man for the oil industry, 8 years representing one firm calling on producers, drilling contractors and prod. supts., principally in Texas and La. To those interested in contacting this group personally I offer an excellent background of experience (not technical). References of the best. Box A-281, The Oil and Gas Journal, Tulsa, Okla.

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1909 Monroe St., Wichita Falls, Texas.

METER man and chemist—30. BS degree chemical engineering. Six years in metering and controlling instruments. Four years in water corrosion and scale prevention control. Married. Employed. Prefer South Texas location with independent refiner requiring combination man. Box A-291, The Oil and Gas Journal, Tulsa, Okla.

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THE OIL AND GAS JOURNAL
Tulsa, Oklahoma

FOR SALE

One gasoline drilling rig with two 85 H.P. Waukesha motors and unitized draw works complete.

300 sets 3" A.P.I. tool joints.

10,000 Ft. 7" O.D. 26# seamless casing, once run.

15,000 Ft. 4½" O.D. seamless drill pipe equipped with both regular and full hole tool joints.

In addition to the above we have 20,000 Ft. of 6" screw line pipe in Oklahoma; also drilling rig capable of drilling to 6500 feet, complete stock of line pipe, casing, drilling and pumping equipment.

Wire, Write or Phone for Prices

Louisiana Iron & Supply Co.
Shreveport, La.

FOR SALE: At Bartlesville 1—2A National Portable Drilling Machine Less Tools. I. T. I. O. Co., Bartlesville, Okla.

---

25 K.W. and 40 K.W. Gas Engines, 220 volts, D.C. Two 100 K.W. Gas Engine-Generator Sets, 220 volts, D.C. 7x6 Ingersoll-Rand ER-1 Air Compressor. Six-inch Oster Pipe Threading Machine. Also large stock of lathes, pipe machines, milling machines, etc. Send for our list.

Terms to suit.

CINCINNATI MACHINERY & SUPPLY CO.
26 West 2nd St., Cincinnati, Ohio

FOR SALE

30-TON S/G LIMA GASOLINE, 0-4-0 SWG. LOCO. NEW 1931, GOOD COND. ROLLER BEARING. Immed. Delivery. SEND US YOUR INQUIRIES FOR ANY KIND OF LOCOMOTIVES

IRON & STEEL PRODUCTS, INC.
13412 S. Brainard Ave.
Chicago, Ill.
"Anything containing IRON or STEEL"

FOR SALE: 1—No. 28 Star steam drilling machine 60' mast serial C 507, less tools, located near Wynona, cheap. I. T. I. O Co., Bartlesville, Okla.

REFINERY GATE VALVES

Reconditioned and Tested
STEEL and CAST IRON
O.S.&Y. Flanged and Screw End
ALL STANDARD MAKES
Largest Stock in Midwest
We save you half

West Tulsa Pipe and Supply Co.
L.D. 635 P.O. Box 1865
TULSA, OKLAHOMA

INTEGRATOR — EMCO-McGAUGHY MAKE—IN GOOD CONDITION, ATTRACTIVE PRICE. U. & I. SUPPLY CO., JACKSON, MICH.

FOR SALE: 1—Ideco Portable Standard Rig suitable for drilling, pumping, or servicing, complete less motor. I.T.I.O., Bartlesville, Okla.

SMALL complete rotary. Longyear rotocore hoist. Derrick on truck. 7¼ x 10 G D pump. Two gas engines. Ready to drill less drill pipe. 109 N. Waggoner, Electra, Texas.

FOR SALE—One 84 ft. angle iron derrick with crown block and steel bull wheels. Carl T. Matthews, Hominy, Oklahoma.

YOUR dependable and cheapest source of supply!
Tank & Freight Cars; any kind
Tank & Freight Car Repair Parts; all kinds Locomotives; all types
Relaying Rails

Perhaps *we* can supply your requirements and—immediately!
OTHER MACHINERY AND EQUIPMENT TOO!

Destination inspection if desired!

IRON & STEEL PRODUCTS, Inc.
13412 S. Brainard Ave., Chicago, Ill.
"Anything containing IRON or STEEL"
Ask to be placed on our various mailing lists.

COMPLETE 6500 BBL. TOPPING AND CRACKING PLANT
BARNSDALL REFINERY—OKMULGEE, OKLAHOMA
2500 BBL. KELLOGG CRACKING UNIT—4000 BBL. TOPPING

Will sell all or any part—Will quote "As is",
Dismantled and loaded or Re-erected your site
"Send Us Your Inquiries"

SONKEN-GALAMBA SUPPLY COMPANY

W. C. Berry and H. J. Galamba
Riverview at Second, Kansas City, Kansas

Robt. W. Duden
2100 S. Union, Tulsa, Oklahoma

FOR SALE OR LEASE
Any part of 50 tank cars. Pennsylvania Oil Products Refg. Co., Warren, Pa.

TRACTORS
Caterpillars, crawler type, size "35," $375; size "65" with nigger-head winch, $750; Caterpillar RDS with bulldozer, $2000; Allis-Chalmers Model L with bulldozer $1750. Guaranteed, slightly used. O. C. Evans, Mt. Sterling, Ky.

FOR SALE

ANY QUANTITY

NEW SEAMLESS STEEL COUPLINGS

750—13" O. D. (12½" Pipe) 8-V Thread x 8¼" long, Line, at $1.35 each.
3000—1¼" Black Merchant Forged Steel, at 4c each.
2500—1½" Black Merchant Forged Steel, at 5½c each.
6000—1¼" Galv. Merchant Forged Steel, at 5¼c each.

RECONDITIONED PIPE

30,000 feet 12", 50 lb. at $1.25 per foot.
80,000 feet 6" Std. at 38c per ft.
All of the above F.O.B. Philadelphia District, subject to prior sale. Pipe in lengths 18'0" and longer, plain ends.

EASTERN PIPE SUPPLY COMPANY
1424 N. NINTH STREET
PHILADELPHIA PENNA.

FOR SALE: 4—OCS Roller Bearing Chain Driven Sand Reels. I. T. I. O., Bartlesville, Okla.

FOR SALE OR MAY LEASE
COMPLETE
STANDARD DRILLING OUTFIT

ALL equipment is the latest type and is in first class condition. New 125 Diesel Caterpillar. This outfit is complete with fishing tools. Inquire Box 112, Jerome Hotel, St. Joseph, Mo.

FOR SALE, liquid purification plant, capacity 6,000,000 cubic feet of gas per day, also 4 steel purifier boxes, capacity 6,000,000 cubic feet per day. All in excellent condition. Operation ceased November 1, 1940.

Box A-270
The Oil and Gas Journal, Tulsa, Okla.

RECEIVER'S SALE

5 fully equipped producing gas wells, 6 producing oil wells, 3 equipped non-producing oil and gas wells. National Drilling Machine, tools and miscellaneous equipment. Leasehold rights on 174 acres. Room for Additional Development.

SALE — WEDNESDAY—JANUARY 15, 1941—1:00 P.M. on Premises 5 miles South of St. Clairsville, Ohio. For details write Carter Thornburg, Receiver, The Richland Developing Association, St. Clairsville, O.

FOR SALE

Rotary rig complete with exception of drill pipe, steam outfit, 2 good 90 H.P. boilers, one 100 H.P. boiler, outfit unitized, 5C3 Union Tool draw works, one Lucey 12000 mud pump, one Johnson gumbo buster, twin 12 x 12 Ajax engines, two 3 KW generators, pumps, 2 boiler feed pumps, outfit for 6 inch drill pipe, complete line of small tools; One unitized Shaffer drilling-in unit with unitized bull wheels, 75 H.P. Oil Well code boiler, good ⅝" 5000 ft. sand line and all necessary standard drilling-in tools.

STEARNS-WALKER DRILLING CO.
805 Ellis Singleton Bldg., Wichita, Kans.

FOR SALE: In Oklahoma City field 50—1000 barrel BS&B VP used oil storage tanks, Cheap. I. T. I. O., Bartlesville, Oklahoma.

NOTICE — CABLE-TOOL CONTRACTORS. Save money; good used wire lines. All sizes up to 5,000 ft. long. See us before you buy. General Tool & Supply Co., P.O. Box 4387, Oklahoma City, Oklahoma.

One 7' x 12' two-door steel tool house. One 4-in-line roller bearing crown block with 36" manganese steel sheaves on 20" beams. A-1 shape. 1300 Ramsey Tower, Oklahoma City, Oklahoma.

FOR SALE: At Oklahoma City 2—set slightly used 6½" Spang Weldless drilling jars 4½" stroke 3¼"—4¼" box and pin, $100.00 per set. I. T. I. O., Bartlesville, Okla.

TWO WELL SERVICING UNITS, one 30 and one 60 model Caterpillar tractors with Cardwell and Hopper winches respectively. A-1 condition, priced reasonably with terms. Paul Rutledge, 424 N. Cincinnati, Tulsa, Okla.

FOR SALE: 2500 Barrel Pipe Still, Tower, Condensers, etc., complete. A-1 condition. P. O. Box 568, Warren, Pa.

FOR SALE: Two O C S Gear Driven Pumping units. Pump four wells each. Twenty-five horse Electric Motors. Big Spring Iron and Metal Co., Big Spring, Texas.

LARGE size spudder, tools 15½ inch, new lines, new motors, fully equip., A No. 1 condition. Also Shallow Bartlesville Sand production. Box 378, Cherryvale Kansas.

FOR SALE—$300 EACH
6 Good 12" x 12" Twin Steam drilling engines, Ideal—Lucey's—Johnsons.
LUCEY PRODUCTS CO.
Tulsa, Okla.

FOR SALE: At Bartlesville, Oklahoma, 1—50 HP Kewanee locomotive type boiler with stack 150# WP. Will pass state inspection. $200.00. I. T. I. O., Bartlesville, Okla.

FROM REFINERY equipment we offer 1—ten thousand barrel riveted tank, 2—Scotch Marine Boilers, 2—6' x 40' Bubble Towers, 1—5' x 51' Bubble Tower, 2—5' x 40' Flash Towers, 300—4" Still Header Boxes, 1—6' x 96' Smoke Stack, 2—18 x5 x 18 Pumps, 1—10 x 6 x 24 Worthington Simplex Hot Oil Pump, 1—22 x 36⅝ x 6 x 24 Wilson Snyder Duplex Hot Oil Pump, 3—85 HP Diesel Engines, 1—Cracking Furnace, brick, castings, and structure, 1—Exhaust Steam Heater.

Box 1011 — Mt. Pleasant, Texas.

Equipment Wanted

WANTED — Portable spudder for use eastern Oklahoma. Give description and price. Box A-293, The Oil and Gas Journal, Tulsa, Okla.

Mailing Lists

ROYALTY owners, Oil Investors, Unit holders, Stockholders in Oil and Royalty Companies. Personnel lists of every branch of oil industry. All by States. We buy lists. New catalogues ready. Oil Industry Mailing List Co., Tulsa Loan Bldg., Tulsa, Oklahoma.

If we do not maintain a classification exactly suited to the type of advertisement you wish to run we shall be glad to create a fitting one.

Classified Department.

CRUDE-OIL PRICES IN REPRESENTATIVE FIELDS

Complete crude-price schedules are now being published in the first issue of each month. The last complete schedule was published in the December 5 issue. All changes in crude-oil-price schedules will be published completely in the first issues following the announcement of the changes. Following are representative crude-price schedules in barrels (42 gal.):

East Texas	$1.10
Conroe	1.27
Tepetate, Louisiana	1.03
Smackover, Arkansas, heavy	.73
Illinois basin	1.15
Pecos County, Texas	.78
Lance Creek, Wyoming	.77
Bradford, Pennsylvania	2.15

Gravity Schedules

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

	Hill, California* Signal	Oklahoma, Kansas	Coast, Texas Gulf
14-14.9	$0.65	....	....
15-15.9	.65	....	....
16-16.9	.65	....	....
17-17.9	.65	....	....
18-18.9	.65	....	....
19-19.9	.69	....	$0.86
20-20.9	.73	$0.70	.88
21-21.9	.78	.72	.90
22-22.9	.82	.74	.92
23-23.9	.86	.76	.94
24-24.9	.90	.78	.96
25-25.9	.95	.80	.98
26-26.9	.99	.82	1.00
27-27.9	1.03	.84	1.02
28-28.9	1.07	.86	1.04
29-29.9	1.10	.88	1.06
30-30.9	1.14	.90	1.08
31-31.9	....	.92	1.10
32-32.9	....	.94	1.12
33-33.9	....	.96	1.14
34-34.9	....	.98	1.16
35-35.9	....	1.00	1.18
36-36.9	....	1.02	1.20
37-37.9	....	1.04	1.22
38-38.9	....	1.06	1.24
39-39.9	....	1.08	1.26
40-40.9	....	1.10	1.28

*Effective Feb. 1, 1940.

Tank-Wagon Changes

Standard Oil Co. of New Jersey advanced kerosene tank-wagon prices 0.25 cent per gallon December 12 at Baltimore, Md.

Standard Oil Co. of Kentucky reduced the tank wagon and dealer gasoline price 1 cent per gallon December 5 at Augusta, Ga. The company advanced the kerosene price 1 cent December 16 at Atlanta, Ga.

Atlantic Refining Co. advanced the gasoline tank-car and tank-wagon prices 1.1 cents December 12 at Scranton, Pa.

Socony-Vacuum Oil Co., Inc., advanced the gasoline tank-car price 0.4 cent and the tank-wagon price 0.5 cent per gallon December 10 at New York City. The tank-wagon price was advanced 0.3 cent December 12 at Portland, Me. A reduction of 1.2 cents in the tank-wagon price was made December 13 at Burlington, Vt., and a decrease of 0.6 cent per gallon was posted December 16 at Boston, Mass.

Continental Oil Co. reduced the tank-wagon price of gasoline 2.5 cents per gallon September 24 at Cheyenne, Wyo.

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the OIL AND GAS JOURNAL

CEMBER 26
1940

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Leaders

De la misma manera que los GANCHOS TRIPLES BJ y la línea de ALAMBRE de TESTIGOS PERFORANTES BJ ELLIOTT han sido aceptados como tipos normales ó "standard" en todos los campos petroleros, también las demás HERRAMIENTAS BJ de PERFORACIÓN descritas é ilustradas en las páginas interiores son indiscutiblemente leaders de seguridad, eficiencia y economía.

Examine las páginas 192 y 193 con detenimiento y atención.

Look on Pages 192 and 193.

Just as BJ TRIPLEX HOOKS and BJ ELLIOTT WIRE LINE CORE DRILLS are accepted as "Standard" in every oil field, the other BJ OIL TOOLS described and illustrated inside are LEADERS in Safety, Efficiency and Economy.

BJ

CONDENSED CATALOG OF MEASUREMENT AND CONTROL EQUIPMENT

CATALOGO CONDENSADO DE EQUIPO DE MEDICION Y GOBIERNO

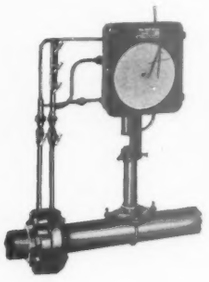
EMCO GAS METERS
CONTADORES EMCO DE GAS

EMCO Cast Iron Meters

Widely used for domestic or small industrial services where installed in exposed locations. Completely described in Bulletin 1000.

Contadores EMCO de Hierro Fundido

De mucho uso en servicios domésticos y servicios industriales limitados, donde quedan instalados en puntos expuestos. Completamente descritos en el boletín 1000.



EMCO Orifice Meters

Compact instrument style meters operating by the orifice principle for measuring extremely large volumes. Completely described in Bulletin 1050.

Contadores EMCO de Orificio

Contadores compactos, de estilo de instrimento, que funcionan sobre el principio de orificio para medir grandes cantidades. Completamente descritos en el boletín 1050

EMCO Large Capacity Cast Iron Meters

Heavy duty, rugged meters for large volumes, high pressure field and industrial services. Completely described in Bulletin 1003.

Contadores EMCO de Hierro Fundido de Gran Capacidad

Contadores durables, de trabajo pesado, para grandes cantidades, para servicios de alta presión en campos e industrias. Completamente descritos en el boletín 1003.

EMCO GAS PRESSURE REGULATORS
REGULADORES EMCO DE PRESION DE GAS

EMCO Ejector Service Regulator

Especially designed for domestic house service to reduce high inlet pressures to constant, safe utilization pressures. Completely described in Bulletin 1026.

Regulador de Servicio de Eyector EMCO

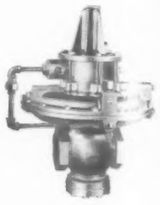
Especialmente proyectado para servicio doméstico de casa, para reducir las altas presiones de entrada a presiones de utilización constantes y seguras Descripción completa en el boletín 1026.

EMCO Balanced Valve Regulators

Made in both high and low pressure types, for large volume, pipe line service. Completely described in Bulletin 1006.

Reguladores EMCO de Válvula Compensada

Se ofrecen en tipos para alta y para baja presión, para gran cantidad de servicio de líneas de tubería. Completamente descritos en el boletín 1006.



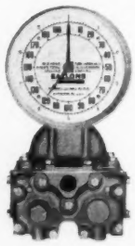
EMCO "1001" Regulator

For controlling the pressure at town border stations, small distribution sections and to industrial consumers. Extremely flexible in control range. Completely described in Bulletin 1059.

Regulador EMCO "1001"

Para gobernar la presión en estaciones cerca de pueblo, pequeñas secciones de distribución y para consumidores industriales. Extremadamente flexible en escala de gobierno. Completamente descrito en el boletín 1059.

PITTSBURGH GASOLINE AND OIL METERS
CONTADORES PITTSBURGH DE GASOLINA Y PETROLEO



Pittsburgh Piston Meters

Made in both two and four cylinder types. Widely used for measuring refined petroleum products, due to extreme accuracy of measurement. Completely described in Bulletin O.G. 103.

Contadores Pittsburgh de Embolo

Ofrecidos en tipos de dos y de cuatro cilindros. Se usan mucho para medir productos de petróleo refinados, debido a su extrema exactitud en medición. Completamente descritos en el boletín O.G. 103.

Pittsburgh Rotocycle Pipe Line Meters

The first meter designed primarily for this particular service—for measuring large volumes of crude or refined petroleum products being transported in pipe lines. Completely described in Bulletin O.G. 125.

Contadores Pittsburgh Rotocycle para Línea de Tubería

El primer contador primariamente proyectado para este servicio particular—para medir grandes cantibades de productos crudos o refinados de petróleo, transportados por líneas de tubería. Completamente descritos en el boletín O.G. 125

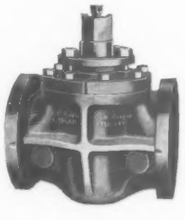
Pittsburgh Rotocycle Meters

Extremely accurate, sensitive meters of the rotary type, for use on bulk plants and tank trucks. Completely described in Bulletin O.G. 127.

Contadores Pittsburgh Rotocycle

Contadores extremadamente exactos y sensitivos, del tipo giratorio, para uso en plantas grandes y camiones tanques o cisternas. Descritos en detalle en el boletín O.G. 127.

NORDSTROM LUBRICATED PLUG VALVES
VALVULAS DE TAPON NORDSTROM LUBRICADAS



Nordstrom Standard Valves

"Sealdport" lubrication forces lubricant under high pressure between the plug and body, making the valve leak-resistant and freeing the plug to assure easy operation. Completely described in Bulletin V-108.

Válvulas Nordstrom Normales

La lubricación "Sealdport" inyecta lubricante bajo alta presión entre el tapón y el cuerpo, haciendo la válvula resistente al escape y lirando al tapón, para asegurar fácil funcionamiento. Completamente descritas en el boletín V-108.

EMCO-NORDSTROM Valves

Have standard gate valve face-to-face dimensions. Can be used to replace valves of other types without altering existing pipe dimensions Completely described in Bulletin V-108.

Válvulas EMCO-NORDSTROM

Tienen las dimensiones normales de cara a cara de la válvula de compuerta. Puede usarse en lugar de otros tipos de válvula, sin alterar las existentes dimensiones del tubo. Completamente descritas en el boletín V-108.

Nordstrom Hypreseal Valves

For super valve service, at extreme temperatures and pressures. Can be furnished Merchromed for the utmost resistance to high temperature, corrosion and erosion. Completely described in Bulletin V-107.

Válvula Nordstrom Hypreseal

Para servicio superexcelente de válvula, a temperaturas y presiones extremas. Puede suministrarse tratada con mercurio y cromo para maxima resistencia a la alta temperatura, corrosión y erosión. Completamente descrita en el boletín V-107.

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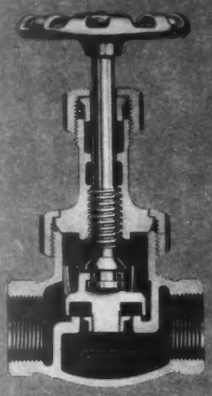
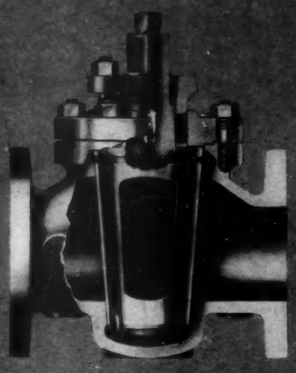
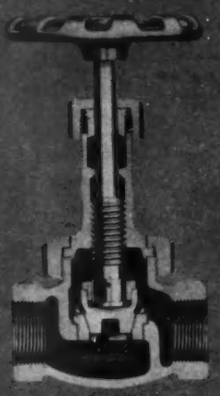


WALWORTH FIG. 95 BRONZE GLOBE VALVE
SOUPAPE DE GLOBE EN BRONZE WALWORTH FIG. 95
VÁLVULA DE GLOBO DE BRONCE WALWORTH, FIG. 95



WALWORTH LUBRICATED PLUG VALVE
ROBINET DE TAMPON LUBRIFIE WALWORTH
VÁLVULA DE TAPÓN LUBRICADO WALWORTH



WALWORTH FIG. 225-P 500 BRINELL GLOBE VALVE
SOUPAPE DE GLOBE WALWORTH, BRINELL 500, FIG. 225-P
VÁLVULA DE GLOBO BRINELL 500, WALWORTH FIG. 225-P

WALWORTH FIG. 709 IRON BODY SADDLE GATE VALVE
VANNE A SELLE EN FER WALWORTH, FIG. 709
VÁLVULA DE COMPUERTA DE HIERRO CON SILLA FIG. 709

Walworth has specialized for many years in the manufacture of valves and fittings for the Petroleum Industry. Some of the more than 40,000 items that Walworth manufactures are illustrated. Catalog will be sent on request.

★

Depuis des années, Walworth s'est fait une spécialité de la fabrication de soupapes, robinets, et raccords pour l'industrie pétrolière. Les illustrations ci-jointes représentent quelques-uns des 40.000 types fabriqués par Walworth. Catalogue sur demande.

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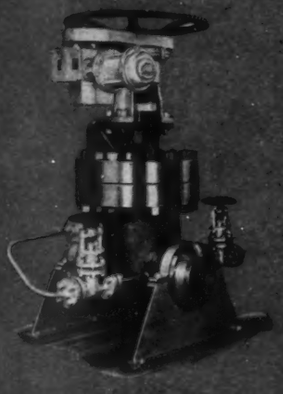

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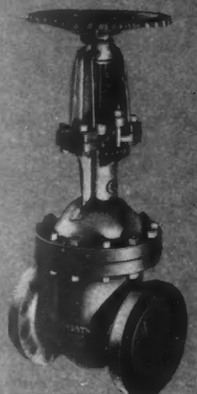

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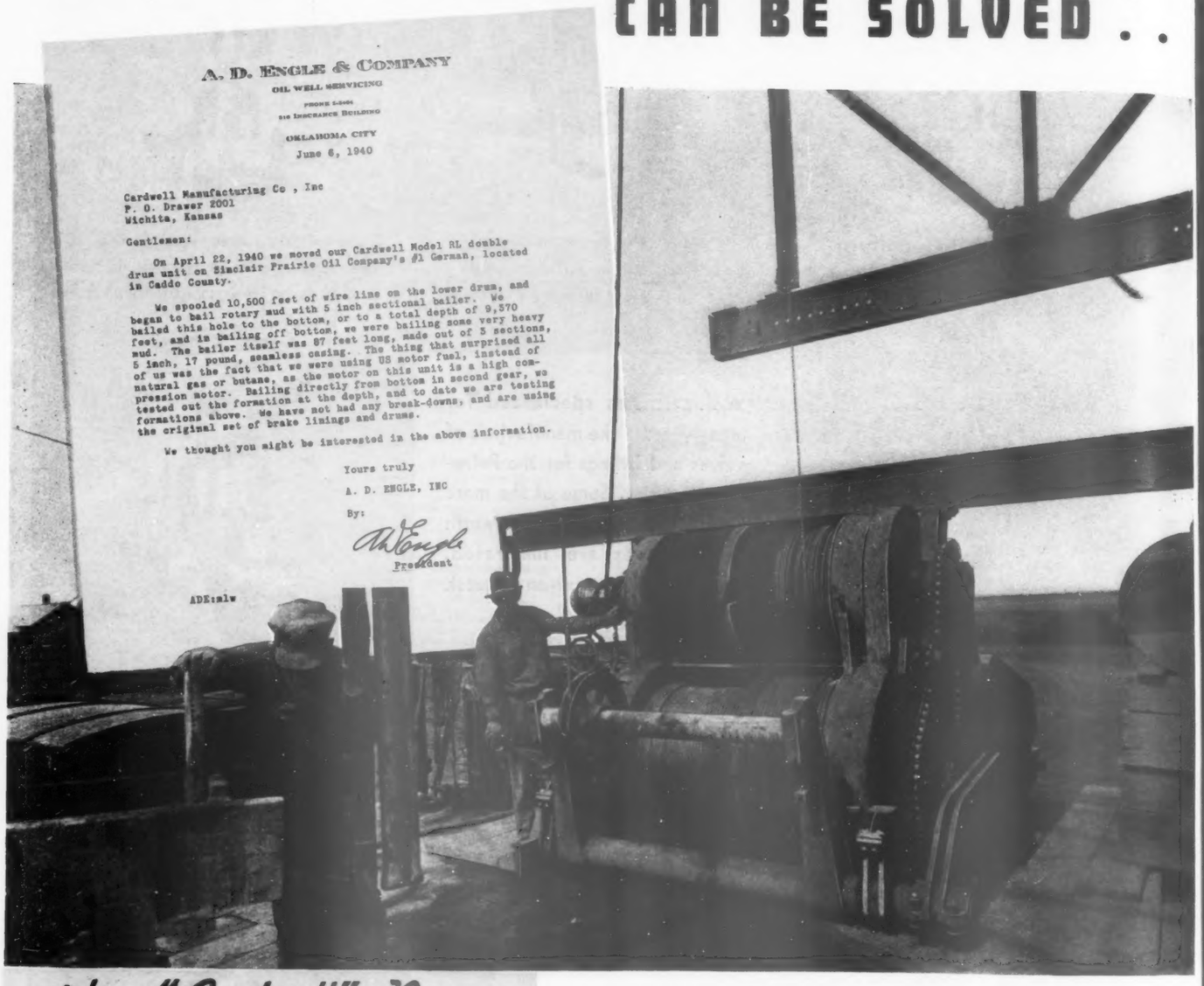

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OKLAHOMA CITY

June 6, 1940

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P. O. Drawer 2001
Wichita, Kansas

Gentlemen:

On April 22, 1940 we moved our Cardwell Model RL double drum unit on Sinclair Prairie Oil Company's #1 German, located in Caddo County.

We spooled 10,500 feet of wire line on the lower drum, and began to bail rotary mud with 5 inch sectional bailer. We bailed this hole to the bottom, or to a total depth of 9,570 feet, and in bailing off bottom, we were bailing some very heavy mud. The bailer itself was 87 feet long, made out of 5 sections, 5 inch, 17 pound, seamless casing. The thing that surprised all of us was the fact that we were using US motor fuel, instead of natural gas or butane, as the motor on this unit is a high compression motor. Bailing directly from bottom in second gear, we tested out the formation at the depth, and to date we are testing formations above. We have not had any break-downs, and are using the original set of brake linings and drums.

We thought you might be interested in the above information.

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By:

President

ADE:mlw

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TRANSMISSION—The new "Cardwell" five-speed, even-step transmission of 1400 foot-pound torque capacity (250hp) has a single lever gear shift and requires only one movement to shift from low to high. This results in faster operation when running in tubing or drill pipe.

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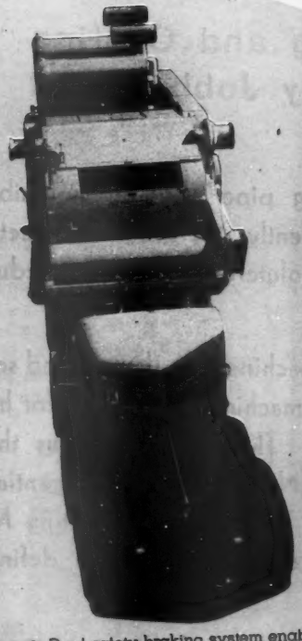

This price includes: two 148 hp. engines with fireproofing, automatic cathead, slush pump drive and air controls

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- High drive outside of transmission permits fast block return while transmission remains in any gear. No transmission shifting is necessary except as load increases or decreases.
- Rotary table operates directly from the transmission with five speeds and reverse, and through a friction clutch drive with air brake.
- Entire draw works with engines in place may be moved over highway without special permit. (It is necessary to remove some small parts.)
- When rotating, no drives are running except to the rotary table, although catheads or drum may be engaged without stopping rotary table or slush pump.
- Air brake on cathead shaft and drum drive
- Air operated automatic cathead.
- All wearing parts including brake flanges are heat-treated and of alloy steel. All sprockets are specially hardened.
- Friction clutch drives throughout are fully ball bearing.
- Rathole drive sprocket is built into the draw works.
- All engines are standard with fireproofing and water-circulated spark arrester
- Sand line drum available.
- Main drive chains run in spray of oil in oil-tight cases.
- Two Westinghouse, two-cylinder compressors are used. All air controls are through Westinghouse diaphragms and "Cardwell" special control valves. All air lines are housed in vibration-proof conduit.
- Dual safety braking system enables one brake to operate independently and hold the load if the other fails.
- Engines, when standard with variable speed governor, are equipped with automatic governor control whereby engines when on pump have reduced RPM for continuous duty and when on draw works have increased RPM for intermittent duty.

Send for this bulletin showing complete specifications on the twin-engine Model S; or see your nearest "Cardwell" representative.

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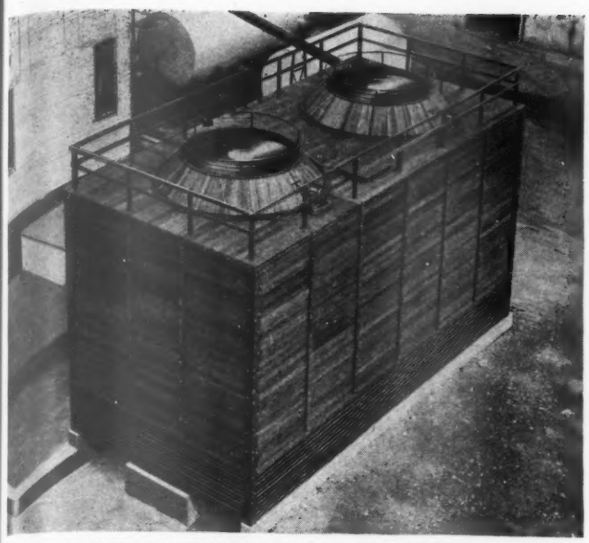

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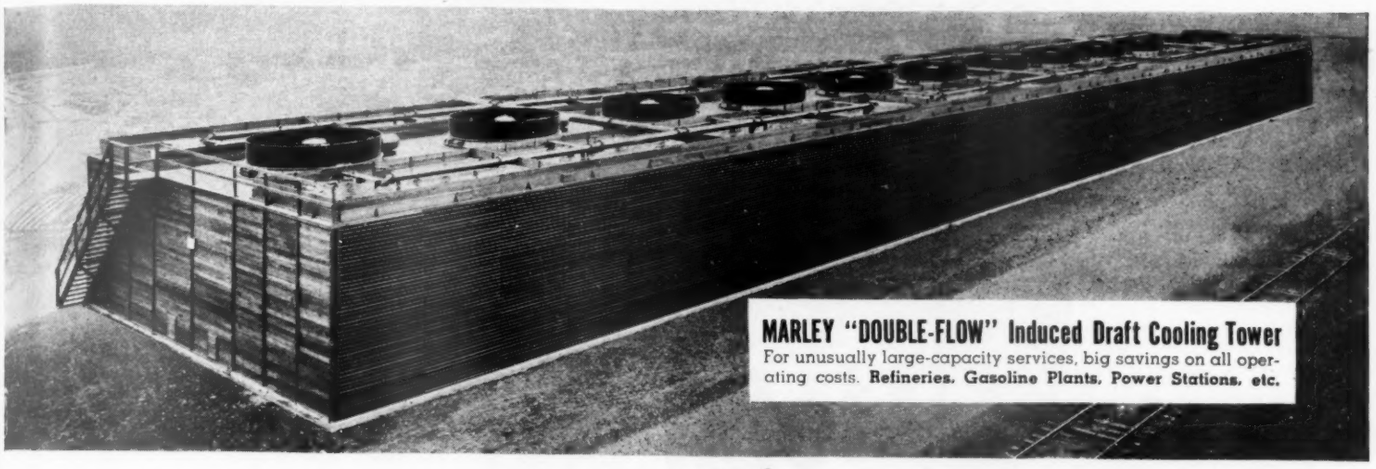

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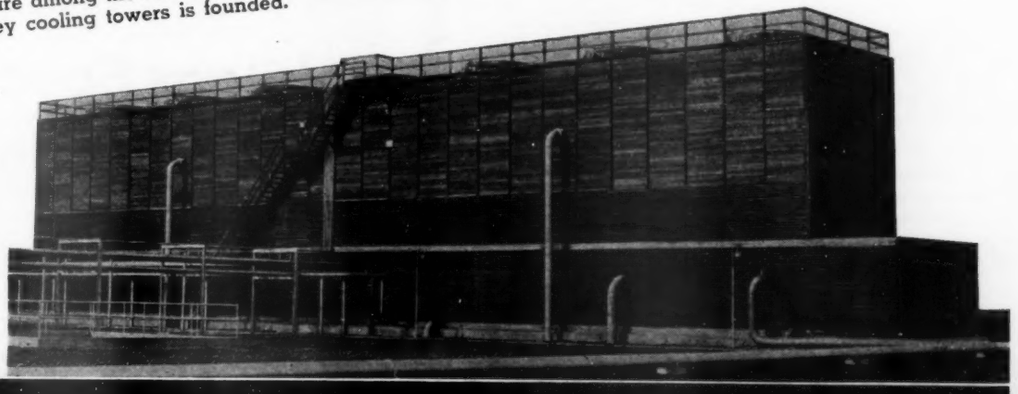

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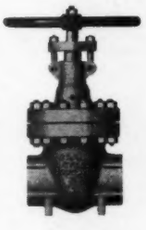

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Estas válvulas de vástago sin levantamiento aseguran mejor gobierno del petróleo y gas en las tuberías de descarga. El disco es de aleación de acero, niquel y cromo, forjada y cementada especialmente para resistir el desgaste. La válvula es de acero Crane Triplex de extraordinaria resistencia de tensión. No hay unión de prensaestopas. El collar del vástago, tiene lubricación bajo alta presión. Conexión Alemite. Se ofrece en tamaños de 2" a 6", para presiones de 400, 500, 1000, 2000 y 3000 libras. Patas fundidas en grupo con el cuerpo.

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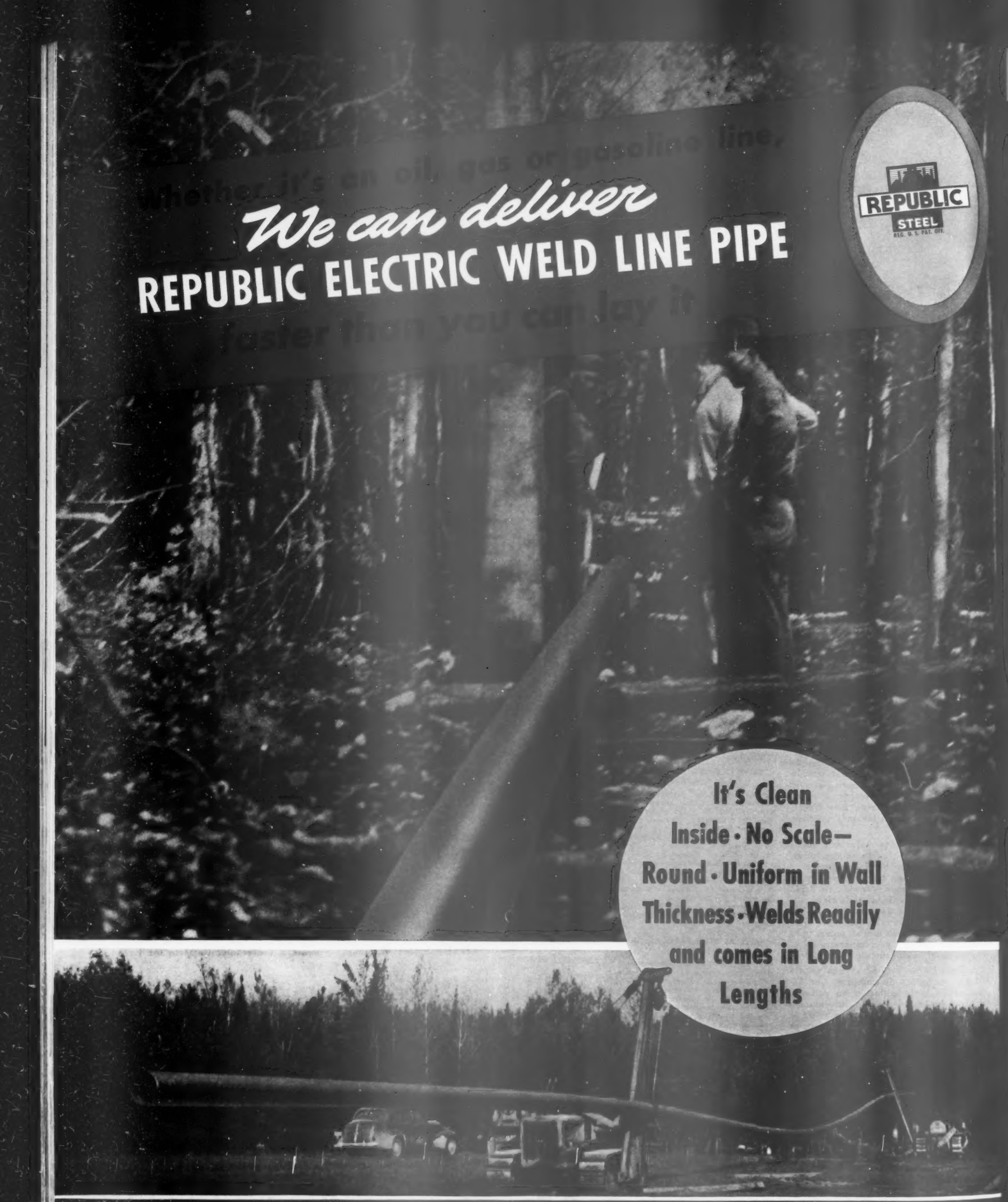

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2 Gilmer Rubber-locked Pulling Cords—Patented construction, concentrating brute strength in thin section, makes cords ride parallel, without twisting, under pressure.

3 Gilmer Heat-resisting Bottom Rubber—Specially developed by Gilmer engineers to insure cool running at high speeds and eliminate "squashing" in the groove.

4 Gilmer Heavy Jackets—Protect the belt's vital working parts from oil, dirt, and grease, making Gilmers last three times as long.

5 Gilmer Controlled Stretch—Pre-tested, to guarantee permanently matched working lengths on every job.

1 Gilmer Caoutchouc à tension de dessus—Tenace, résilient. Ne connáit pas les mauvais ajustages coûteux.

2 Gilmer Cordons de traction à blocage caoutchouc—Construction brevetée qui concentre la force brutale sous une faible épaisseur, assure la marche parallèle des cordons, sans torsion, sous pression.

3 Gilmer Caoutchouc de fond résistant à la chaleur—Création spéciale des ingénieurs Gilmer pour assurer une marche sans échauffement aux grandes vitesses et éviter "l'écrasement" dans la gorge.

4 Gilmer Chemises doubles—Mettent les parties mobiles essentielles de la courroie à l'abri de l'huile, de la crasse et de la graisse, se qui fait durer les Gilmers trois fois plus longtemps.

5 Gilmer Etirage réglé—Essayé au préalable afin de garantir des longueurs motrices conjuguées en permanence dans chaque emploi.

1 Gilmer Caucho de superior tensión. Muy firme y elástico. Evita el costoso equipo inadecuado.

2 Gilmer Cuerdas de tiro saturadas en caucho. Construcción patentada, que concentra enorme fuerza en una delgada sección, haciendo que las cuerdas corran paralelas, sin retorcerse bajo la presión.

3 Gilmer Caucho de fondo de gran resistencia al calor. Preparado especialmente por los ingenieros de la Gilmer para asegurar un funcionamiento sin recalentamiento en las altas velocidades y para evitar el aplastamiento en la ranura o canal.

4 Gilmer Camisas dobles—Protección eficaz a las partes activas de la correa contra el aceite, polvo y grasa, lo que las hace durar tres veces más que las de construcción corriente u ordinaria.

5 Gilmer Estiramiento regulado. Estiramiento regulado y ensayado de antemano para asegurar correas de exacta longitud permanente para cada trabajo.

L. H. GILMER COMPANY • TACONY • PHILADELPHIA, PA. • U. S. A.

THE PHOTOGRAPH SHOWS a fully automatic autographic testing machine, checking complete physical properties of the metals used in Darling Valves. This is just one example of Darling's extraordinary care in checking all manufacturing methods. Every precaution is taken to make sure that each valve reaches the user in strict accordance with Darling's rigid standards.

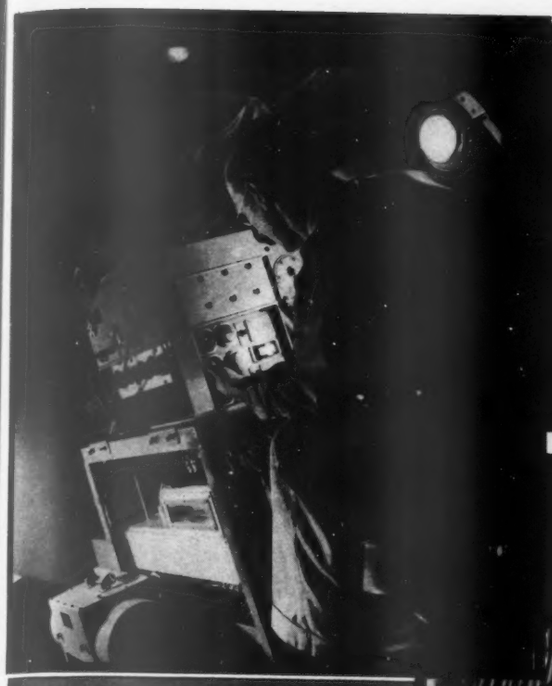
...AND EXPERIENCE SHOWS that this extraordinary care pays dividends. The user gets better valve service. Darling gets another satisfied customer. Get in touch with the Darling representative on your next valve installation!

DARLING
GATE VALVES

DARLING VALVE & MANUFACTURING CO.
Williamsport, Pa.

Representatives in:

New York, Philadelphia, McPherson, Kan., Pittsburgh, Toledo, Houston, Evanston, Ill.



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Electrical Well Logging

Record the formations . . locate the oil sands.

Precision Gun Perforating

Perforate at the exact depth . . . produce the oil sand.

Sidewall Sampling

Take a sample of the oil sand and examine it.

SCHLUMBERGER WELL SURVEYING CORP.
HOUSTON

Welds that equal the Stainless Steel you weld

Tell your Page Distributor the type of Stainless Steel you want to weld. The Stainless Steel electrode he will supply will give you weld metal that equals the Stainless you weld. You can depend on it.

Each of these Page-Allegheny Stainless Steel electrodes was developed in conjunction with the country's largest producer of Stainless to give you electrodes that

1. *give you weld metal that equals the Stainless you weld*
2. *can be used for vertical, overhead or horizontal welding*
3. *give you better Stainless welds at lower welding cost*

Ask your Page Distributor to give you a copy of the booklet "Page-Allegheny Stainless Steel Electrodes." Get complete information from him.

PAGE STEEL AND WIRE DIVISION · MONESSEN, PENNSYLVANIA

AMERICAN CHAIN & CABLE COMPANY, Inc.

ACCO

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OWEN SILENT SPRING COMPANY, INC.
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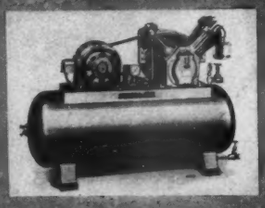
READING-PRATT & CADY DIVISION
READING STEEL CASTING DIVISION
WRIGHT MANUFACTURING DIVISION

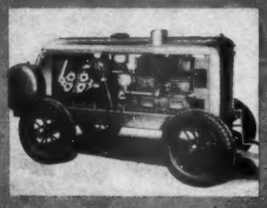
In Canada: DOMINION CHAIN COMPANY, LTD.
In England: BRITISH WIRE PRODUCTS, LTD.
THE PARSONS CHAIN COMPANY, LTD.

OIL FIELD and REFINERY Equipment

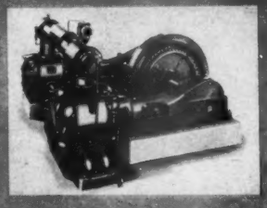
COMPRESSORS



STARTING UNITS ½ to 20 hp. 200 to 1000 lb.

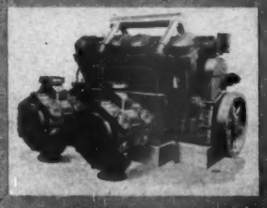


PORTABLES 7 sizes. Oil- or gas-engine-driven



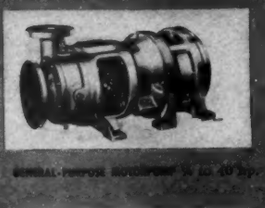
ELECTRIC DRIVEN All pressures. 75 to 3000 hp.

EVG GAS-ENGINE-DRIVEN All pressures. 75 to 300 hp.



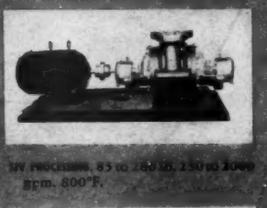
EVG GAS ENGINE-DRIVEN All pressures. 75 and 650 hp.

PUMPS

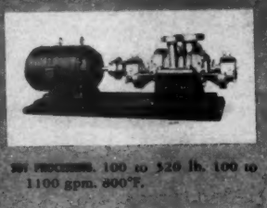


GENERAL-PURPOSE HORIZONTAL 5 to 20 hp.

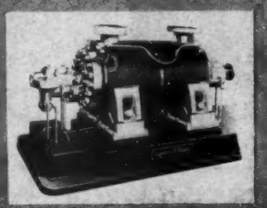
SPL PROCESSING. 5 to 175 hp. 10 to 80 gpm. 800°F.



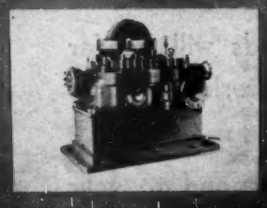
HV PROCESSING. 85 to 280 hp. 250 to 2000 gpm. 800°F.



HV PROCESSING. 100 to 520 lb. 100 to 1100 gpm. 800°F.

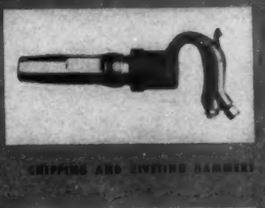


HV CRACKING-GAS CHARGING. 800 to 3000 lb. 200 to 2000 gpm. 800°F.

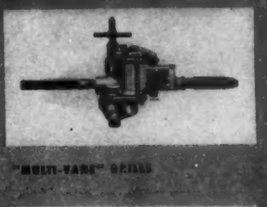


HV PIPE LINE. 200 to 1500 lb. 75 to 200 gpm.

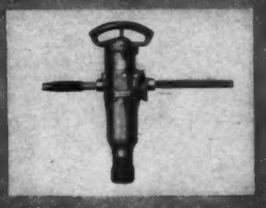
AIR-TOOLS



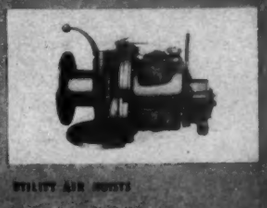
CHIPPING AND RIVETING HAMMERS



"MULTI-VANE" DRILLS



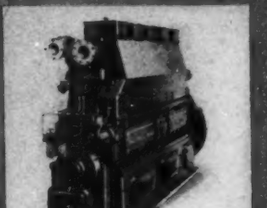
SURFACE WRECKERS



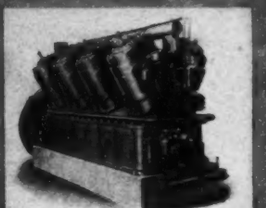
UTILITY AIR HOISTS

TD-30 UTILITY JACKHAMMER

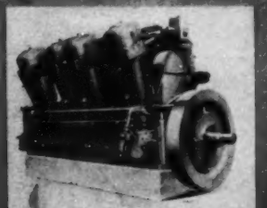
ENGINES



TYPE "S" CONVERTIBLE GAS-ENGINE. 600 rpm. 190 to 510 hp.



PVG GAS ENGINE 400 rpm. 185 to 370 hp.



PVG GAS ENGINE 300 rpm. 485 and 650 hp.

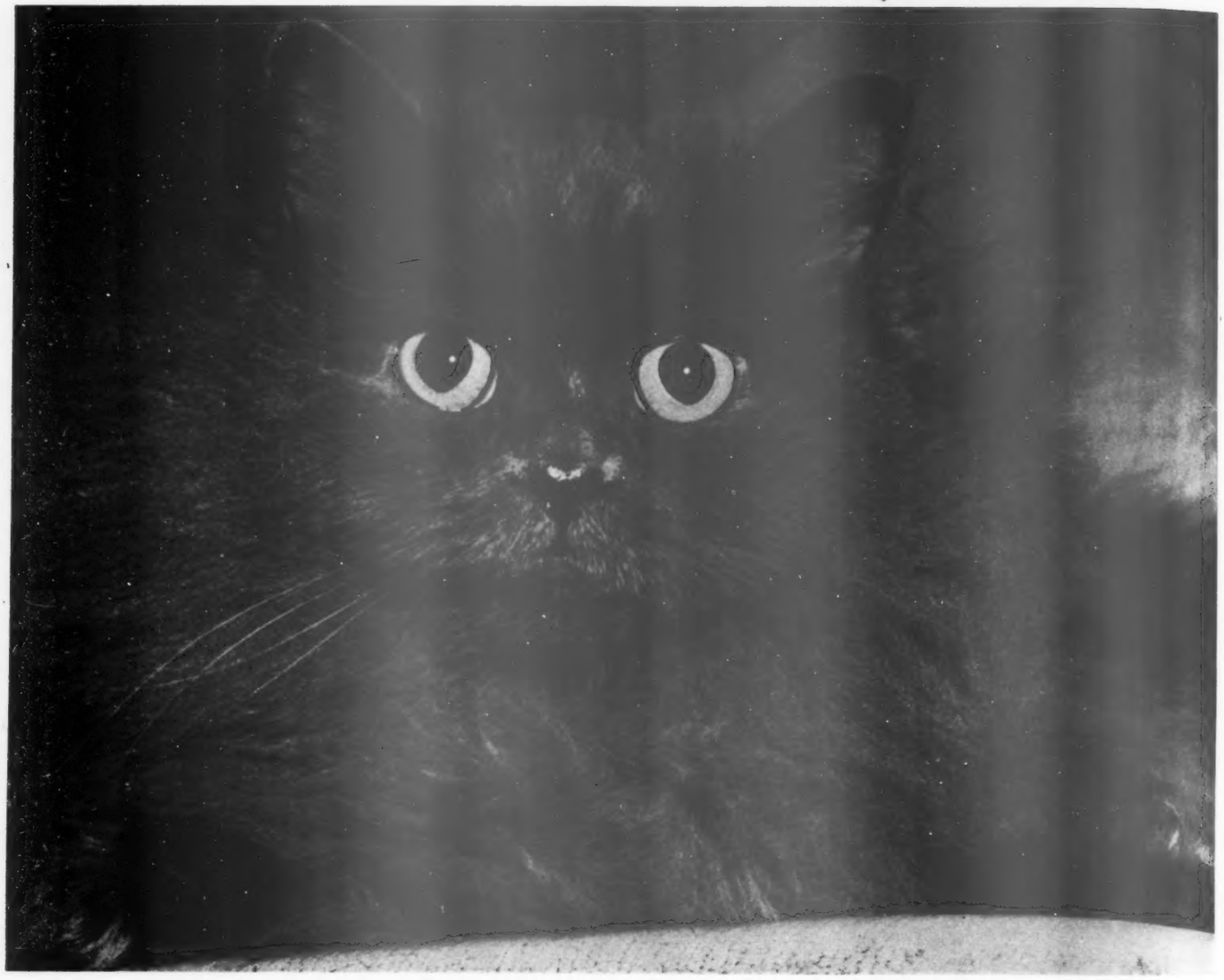
REFINERIES EVERYWHERE RELY ON **Ingersoll-Rand** ENGINES, COMPRESSORS, EJECTORS, CONDENSERS, PUMPS AND AIR TOOLS.

There is an Ingersoll-Rand representative near you. Call on him at any time.

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY 914-14

SEEING *is believing* . . . .



. . . but the most penetrating vision can't see all that goes into your tubes.

A study of performance records will be far more revealing than any manufacturing data we might present.

A Timken representative will respond to your phone call or letter.

We manufacture a complete line of tubes for high-temperature service. Consult us without obligation.

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

TIMKEN
SEAMLESS STEEL TUBES

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

S & J Sampling Bombs FOR ALL TANK PRESSURES

FIGURE S T-2015

Universal Sampling Bomb

Designed for sampling liquids held under pressures up to 125 pounds. Complete with thermometer, high pressure angle and safety valve. Capacity 1.3 quarts, operates through 6″ tank connection.

FIGURE 1500

Temperature Thief

For determining exact temperature of a liquid at any point in any bulk container in the shortest possible time. Thermometer bulb is in contact with liquid trapped in heat insulating chamber. Can be operated through a 3″ gaging nipple.

FIGURE S T-3000

Standard Sampling Bomb

A quart size sampling bomb for use in tanks operating under pressures up to 25 pounds. Complete with thermometer well and safety valve. An opening 4″ or larger is necessary to introduce the bomb into the tank.

The S. & J. Sampling Bombs and Temperature Thief, illustrated above, were designed to furnish the laboratory with a sample of liquid from any storage tank, at any given stratum, delivering the sample in the laboratory under exactly the same pressure as maintained in the tank.

These sampling bombs are designed for pressures up to 125 pounds. They are "cocked" into the open position before being lowered into the tank, through an S. & J. Instrument lock, or other suitable opening. When the tape indicates depth from which a sample is wanted, the bomb is raised and lowered slowly several times through the liquid of this stratum, then a slight jerk on the tape trips the locking device, and the bomb is withdrawn.

Each bomb is equipped with a suitable thermometer so that temperature readings may be taken before the bomb is removed from the Sampling Lock or after removal from the tank. Figures S T-2015 and S T-3000 were designed primarily for the delivery of samples under the same pressures as maintained in the tank and with temperature determinations as incidental. Figure 1500 was designed primarily for determining temperatures, with the entrapped sample serving only to maintain an accurate reading.

SHAND & JURS CO.

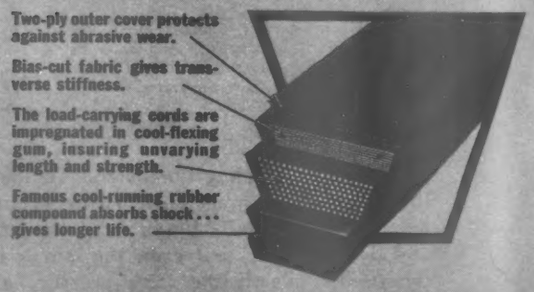
BERKELEY, CALIFORNIA

295 Madison Avenue	225 W. 11th Street	601 Fannin Street	310 South Michigan Avenue
New York	Los Angeles	Houston	Chicago

SHAND & JURS

See How These Texrope Features Save You Money!

BACK OF TEXROPE'S unusual performance records are the many distinctive features that go into these belts, as illustrated below.


Two-ply outer cover protects against abrasive wear.
Bias-cut fabric gives transverse stiffness.
The load-carrying cords are impregnated in cool-flexing gum, insuring unvarying length and strength.
Famous cool-running rubber compound absorbs shock . . . gives longer life.

Wedge Design Helps Give Efficiencies Up to 98.9%!

Texrope belts are *true V-belts* — straight edged from precise moulds. With the Texrope "wedge" design, there is no slipping . . . no jerking. Efficiencies up to 98.9%.

New, Special, Cool-Running Rubber Compound Provides Longer Life!

To meet the tough demands of day-in and day-out operation, Texrope belts have been

TEXROPE DRIVES CUT

"I WAS DEAD WRONG!"

"I Always Had the Idea V-belt Drives Were Pretty Much Alike! But That Was Before I Discovered Texrope V-belt Drives . . . the Drives that Cut Transmission Costs!"

"I NEARLY lost a hole due to transmission failure one day last fall. For three hours it was nip and tuck . . . even today I get a cold sweat thinking about it.

"I never realized the importance of using the right kind of transmission equipment. To me, V-belt drives had all looked pretty much alike . . .

"But that near-tragedy taught me a lesson. It was then I discovered Allis-Chalmers Texrope V-belt Drives.

"And what a difference!

"Yes, I know now I was dead wrong . . . but not any more. I'm taking no more chances of losing a hole. It's Texrope Drives for me from now on . . . and I honestly feel my transmission worries are over!"

See Your Supply Company and Specify Texrope!

Your transmission worries will be over too — if you switch to Texrope Drives! For with these modern drives you get "matched sets" that pull together, giving you greatest protection against belts breaking, against excessive wear.

Also, their wedge design and cool-running construction allows them to operate with greater efficiency. Slipping is eliminated. Shocks and vibrations are absorbed. They are easier to install . . . cheaper to maintain . . . safer on the job!

These points are important features that you should know. They are points that give Allis-Chalmers Texrope Drives superiority in performance, long life, and low maintenance. They are the reasons why they have skyrocketed to number one position as the most popular way to transmit power. Read these features in the center panel carefully!

For complete facts, see your supply company . . . and specify Texrope Drives. Or write Texrope Division, Allis-Chalmers, Milwaukee, Wisconsin.

A 1240

Belts by Goodrich

made with a new, special, cool-running rubber compound that actually increases belt life 100 to 200% over belts of only a few years ago.

Matched Into "Sets" for PULLING Together!

Now, with a newly developed measuring machine, every Texrope belt is tested in a grooved sheave running under normal operating tension . . . and the exact length to 1/100 of an inch is registered on a finely calibrated meter. This means that "sets" of Texrope belts *pull together* . . . wear evenly . . . give longer life.

Backed by Allis-Chalmers 90 Years of Engineering!

Multiple V-belts were orginated and developed by Allis-Chalmers engineers. This same huge engineering staff is prepared at all times to help you on your drive problems . . . to make it easier for you to save money and get better transmission efficiencies.

A Size to Fit Your Needs!

Available in five standard cross-section measurements, and for drives from fractional to 2,000 hp, there's a Texrope Drive that exactly suits your requirements . . . saves you money!

★ Adequate Stocks Carried Throughout U. S. A.

Get Texrope Drives and replacements instantly from Allis-Chalmers warehouses and supply company stocks in all main oil centers.

TRANSMISSION COSTS

"They Just Don't Break!"

. . . . that's what users say about these Galvanometer Suspensions!

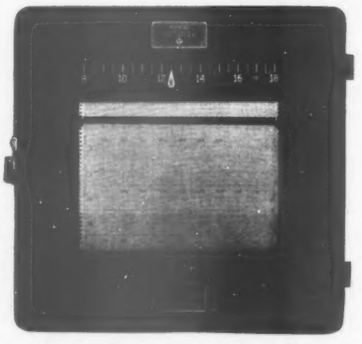
Did you ever see a year or more pass without a single galvanometer suspension replacement in a bank of operating pyrometers?

Several large-scale users of Foxboro Potentiometer Recorders and Controllers have reported this experience. They told us not to bother sending spare suspensions with new instruments on order!

Foxboro galvanometer suspensions are so designed that breakage practically never occurs. Their acid-proof gold strips are longer, heavier, stronger . . . spot-welded, instead of soldered in place. And their end-brackets are made with smoothly-crowned snubbing surfaces that stop destructive shear action.

Yet this is only one of numerous refinements that make Foxboro Potentiometer Instruments more sensitive and more economical to maintain. Other original Foxboro features make possible instant, accurate response with *slower* movement of elements and *fewer* moving parts to wear out!

Get the complete story on these trouble-free instruments. Write for Bulletin 190-4. **The Foxboro Co., 60 Neponset Ave., Foxboro, Mass., U.S.A.** Branches in principal cities of United States and Canada.



Foxboro Potentiometer Recorders and Recording Controllers are guaranteed accurate within ¼ of 1% of scale range.

— RECORDING · CONTROLLING · INDICATING — FOXBORO REG. U. S. PATENT OFFICE —

Potentiometer Instruments

Cost OF NATIONAL DEFENSE IS LESSENED BY BLUEPRINTS

PEASE MODEL "22-16"

because... DRAWINGS MUST BE REPRODUCED MANY TIMES AND BLUE PRINTING PROVIDES THE BEST AND LEAST EXPENSIVE METHOD

Some Reasons why the "22-16" produces better Blueprints faster and at lower cost—

- **SLIDING CONTACT**—smoothes out all inequalities present in all tracings—24¾ inches of uninterrupted exposure area in the Model "22" Printer—more than is possible with a 12-inch cylinder. Polished Trans-Peco glass passes 20% more Actinic rays.
- **ACTINIC ARC LAMPS**—give unequalled uniformity of light emission—burn for 45 minutes without even breaking the arc and then resume instantaneously—There are 4 Actinic Arc Lamps in the 42" and 5 in the 54" Model "22" Printer.
- **THREE SPEED LAMP CONTROL**—10, 15 or 20 amperes as desired, avoiding frequent Dryer heat changes—the mechanical operating speed remains the same, and the lamp amperage varies according to the tracing being reproduced.
- **HORIZONTAL WATER WASH**—floats the exposed paper horizontally without tension thus averting wrinkles—bleeding practically eliminated. Tanks are rust resistant copper.
- **QUICK CHANGE CHEMICAL APPLICATOR SYSTEM**—from Blueprints to negatives in thirty seconds and vice versa—the only method of applying potash to one side and hypo to both sides of the paper. Very economical.
- **8" ALUMINUM DRYING DRUMS**—Either Gas or Electrically Heated. 5 in the Model "16" Washer and Dryer—gradual dry-ing automatically without distortion—"flat as hung wallpaper."
- **SPEED, QUALITY AND LOW COST**—Blueprints at 15 feet per minute with the Model "22-16"—uniform, contrasty prints with clean-cut, sharp lines—exceptionally low cost per square foot.

O.K. Chief Engineer U. S. A. INDUSTRIAL PLANTS

THE C. F. PEASE COMPANY

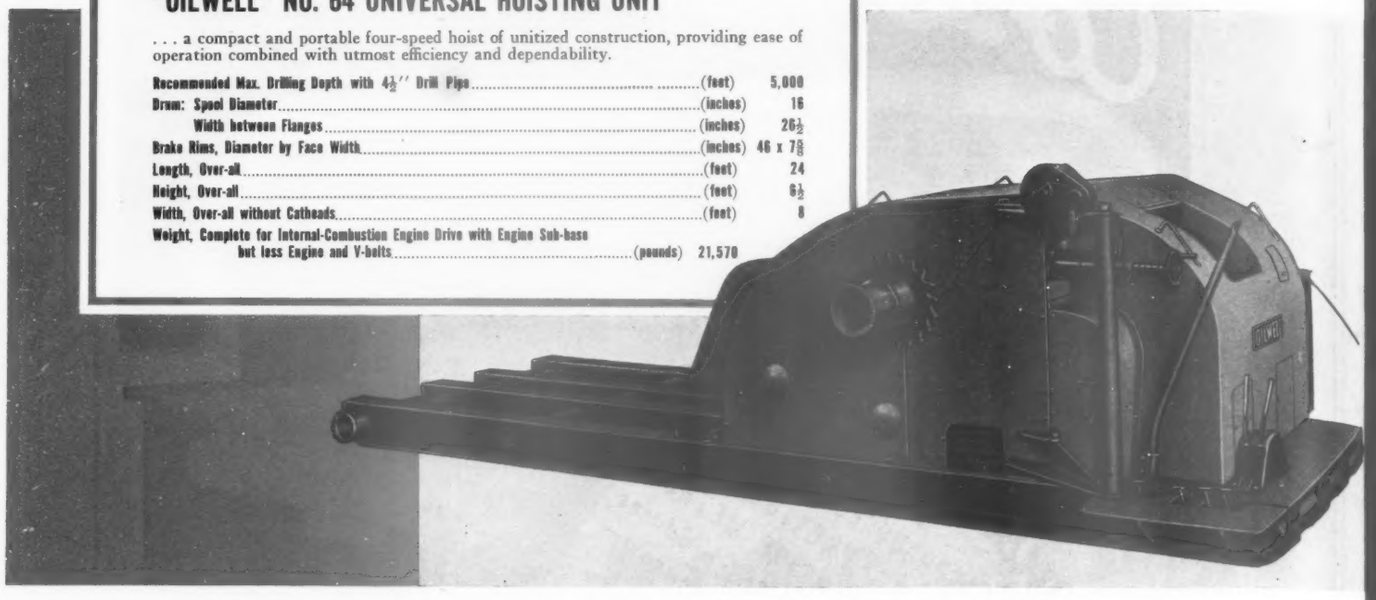
2691 West Irving Park Road • • • Chicago, Illinois

NEW "OILWELL" FOR FASTER, SAFER,

"OILWELL" NO. 64 UNIVERSAL HOISTING UNIT

. . . a compact and portable four-speed hoist of unitized construction, providing ease of operation combined with utmost efficiency and dependability.

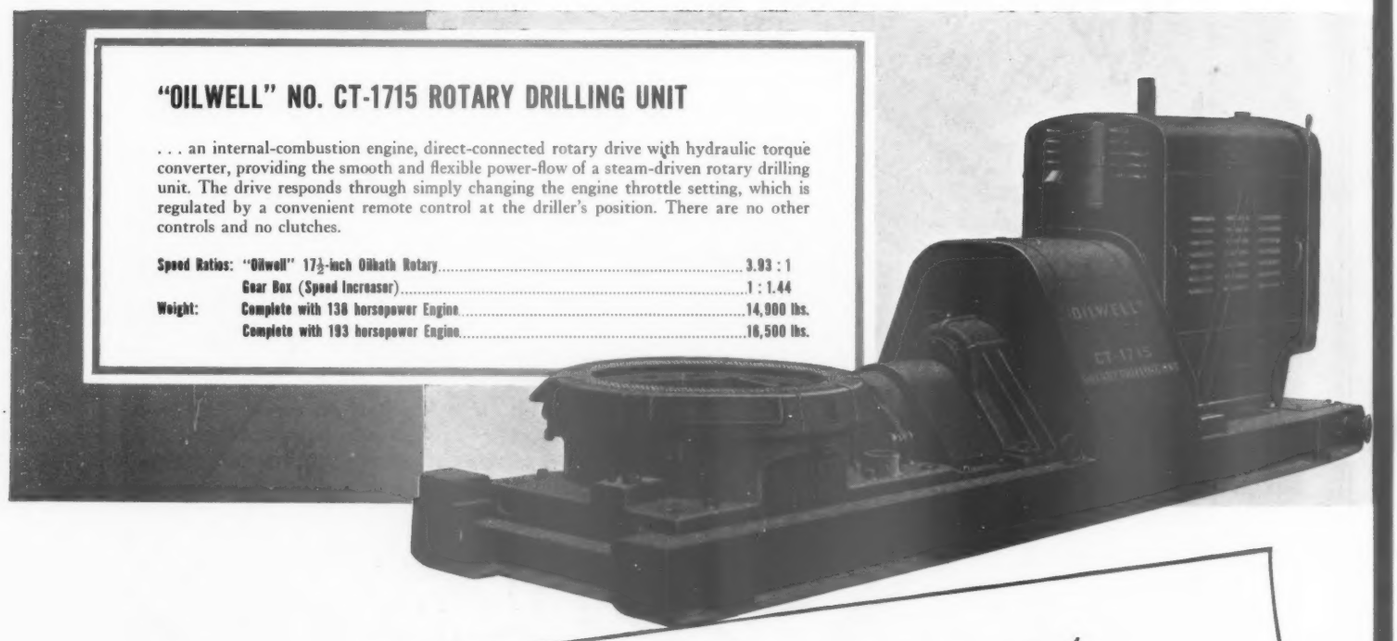
Recommended Max. Drilling Depth with 4½" Drill Pipe	(feet)	5,000
Drum: Spool Diameter	(inches)	16
Width between Flanges	(inches)	26½
Brake Rims, Diameter by Face Width	(inches)	46 x 7⅝
Length, Over-all	(feet)	24
Height, Over-all	(feet)	6½
Width, Over-all without Catheads	(feet)	8
Weight, Complete for Internal-Combustion Engine Drive with Engine Sub-base but less Engine and V-belts	(pounds)	21,570



"OILWELL" NO. CT-1715 ROTARY DRILLING UNIT

. . . an internal-combustion engine, direct-connected rotary drive with hydraulic torque converter, providing the smooth and flexible power-flow of a steam-driven rotary drilling unit. The drive responds through simply changing the engine throttle setting, which is regulated by a convenient remote control at the driller's position. There are no other controls and no clutches.

Speed Ratios: "Oilwell" 17½-inch Oilbath Rotary		3.93 : 1
Gear Box (Speed Increaser)		1 : 1.44
Weight: Complete with 138 horsepower Engine		14,900 lbs.
Complete with 193 horsepower Engine		16,500 lbs.



The swift advancement of your drilling program requires Modern Equipment

ROTARY EQUIPMENT
MORE ECONOMICAL DRILLING

"OILWELL" SUPER SWIVEL

. . . designed for the requirements of tomorrow, providing an extra factor of safety for the highest speeds and greatest depths of today.

Dead-load Capacity	(tons)	400
Maximum Recommended Drilling Depths		
with 4½" - 18 # Drill Pipe: 100 r.p.m.	(feet)	17,000
200 r.p.m.	(feet)	14,000
400 r.p.m.	(feet)	11,000
Fully Streamlined Fluid Passage, Diameter	(inches)	4
Body, A.P.I. Left-hand Tool-joint Threads	(inches)	7⅝
Wash Pipe, faced Inside and Outside		DI-HARD
Weight, Complete less Hose Connection	(pounds)	4,800

"OILWELL" 21-INCH SUPER-SPEED ROTARY

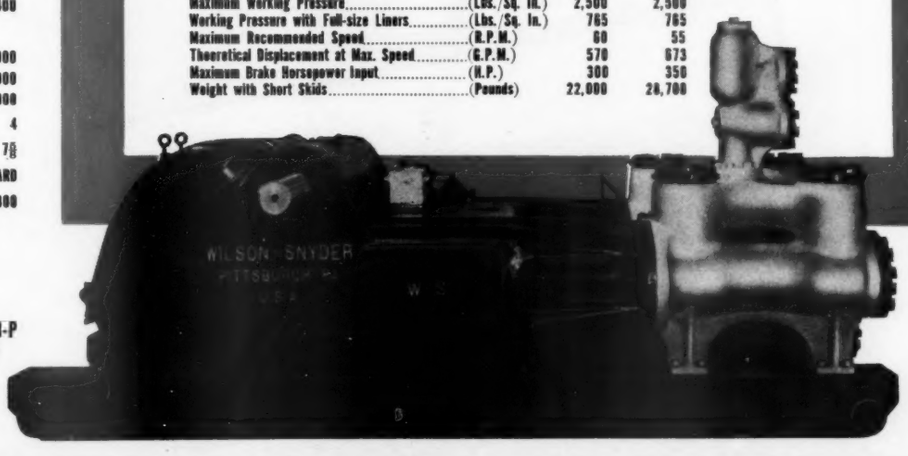
. . . designed, constructed and tested for 1,000 r.p.m. operation. Fully heat-treated, spiral-bevel gearing with surface-hardened pinion. Self-centering, angle-contact main bearing with high-precision balls of large diameter and surface-hardened, heat-treated and ground, alloy-steel races. Positive forced-feed and circulating-oilbath lubrication.

Rated Supportable Dead-load Capacity	(tons)	300
Maximum Recommended Drilling Depth	(feet)	17,000
Gear Ratio		2.61 : 1
Weight, Complete less Drive Bushing	(pounds)	9,624

"OILWELL" NO. 14P-HD AND WILSON-SNYDER NO. 18-P POWER SLUSH PUMPS

. . . sturdier power pumps for the more severe drilling requirements. Both pumps are built for efficient and reliable performance over a wide range of operating conditions.

		No. 14P-HD	No. 18-P
Maximum Liner Size by Stroke	(Inches)	7¼" x 14"	7¼ x 18"
Hydraulic Test Pressure, Discharge	(Lbs./Sq. In.)	4,000	4,000
Maximum Working Pressure	(Lbs./Sq. In.)	2,500	2,500
Working Pressure with Full-size Liners	(Lbs./Sq. In.)	765	765
Maximum Recommended Speed	(R.P.M.)	60	55
Theoretical Displacement at Max. Speed	(G.P.M.)	570	673
Maximum Brake Horsepower Input	(H.P.)	300	350
Weight with Short Skids	(Pounds)	22,000	28,700



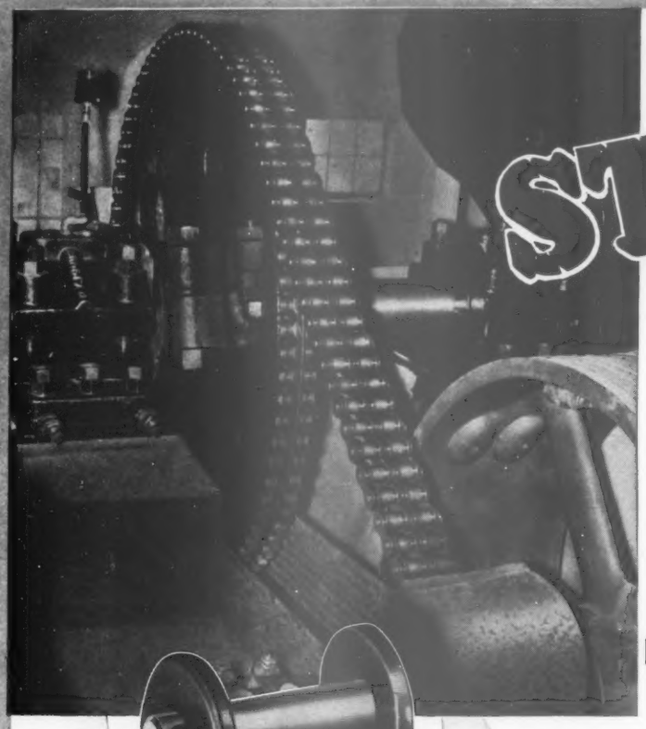
WILSON-SNYDER NO. 18-P
POWER SLUSH PUMP

OIL WELL SUPPLY COMPANY

EXECUTIVE OFFICE—DALLAS, TEXAS
EXPORT DIVISION OFFICE—
30 ROCKEFELLER PLAZA, NEW YORK CITY

Branch Stores in all Oil Fields
United States Steel Corporation Subsidiary

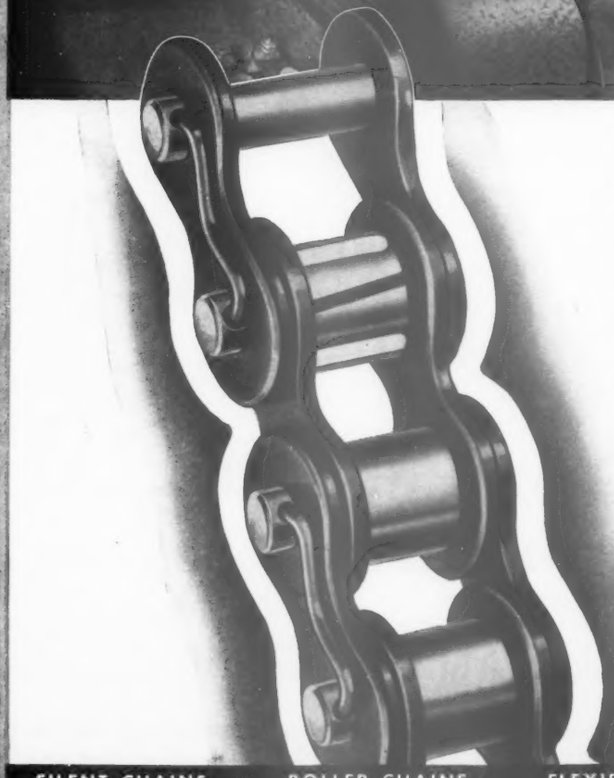
DIVISION OFFICES—
OIL CITY, PENNA. DALLAS, TEXAS
LOS ANGELES, CALIF.



STANDS UP

MORSE *Lifeline* ROLLER CHAIN

FOR OIL FIELD SERVICE



There's an answer to the chain-killing lubrication deficiency that sends so many oil field chains to the discard before their time . . . It's Morse "Lifeline" lubrication—the roller chain design that puts a force feed lubrication system in every link.

Under identical conditions, Morse Roller Chain has 25% to 50% longer life than chains of ordinary design. For Morse design leads oil to the heart of the link, the pin and bushing bearing surfaces.

Add up the advantages of Morse Roller Chain for oil field service! Here they are:

- A record of full dependability—no failures to date.
- Completely interchangeable with all other standard round pin roller chains.
- Morse spring lock cotters, dampen vibration and chain whip.
- 25% to 50% longer life.
- Low price. Actually no more than shorter-lived chains.
- Factory stocks in Houston, other stocks nearby to serve you, complete and at your call.

Let us tell you more about the way Morse Roller Chain can save you money and trouble.

Houston Office: 1418 Polk Ave., Houston, Texas

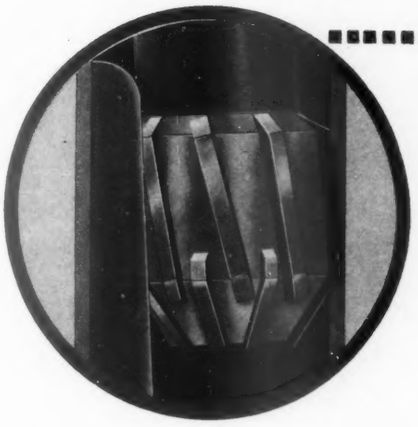
SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS KELPO CLUTCHES

MORSE *positive* DRIVES

MORSE CHAIN COMPANY ITHACA N. Y. DIVISION BORG-WARNER CORP.

TWO VALUABLE ADVANTAGES

Keep Kinzbach Ahead In Side Wall Equipment

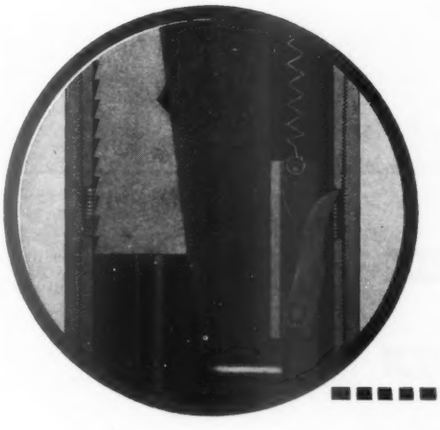


1 *A Long, Clean Window*

There is a Kinzbach Mill to match the requirements of any milling job regardless of casing quality or the conditions involved. The spiral setting of Kinzbach insert blades assures a uniform depth cut and minimizes the danger of drill pipe twist-offs.

Kinzbach Milling Tool Blades are made of high speed tool steel, are properly heat-treated, and are precision ground to provide the most efficient cutting action possible. Kinzbach Mills have been proved in more than 12 years of field service to **cut a long, clean, consistent window every time.**

In addition to the many regular types of Kinzbach Mills, we can furnish special mills for specific jobs.



2 *A Mill-Out Between Couplings*

A patented feature of the Kinzbach Whipstock is its arrangement for setting in a coupling and the user's assurance that **the window must be within the one joint of casing,** eliminating all chance of milling out a joint and parting the casing string. Since the slip always engages the pipe at the point reinforced by the coupling, any distortion which might interfere with the wedging action of the slip is minimized.

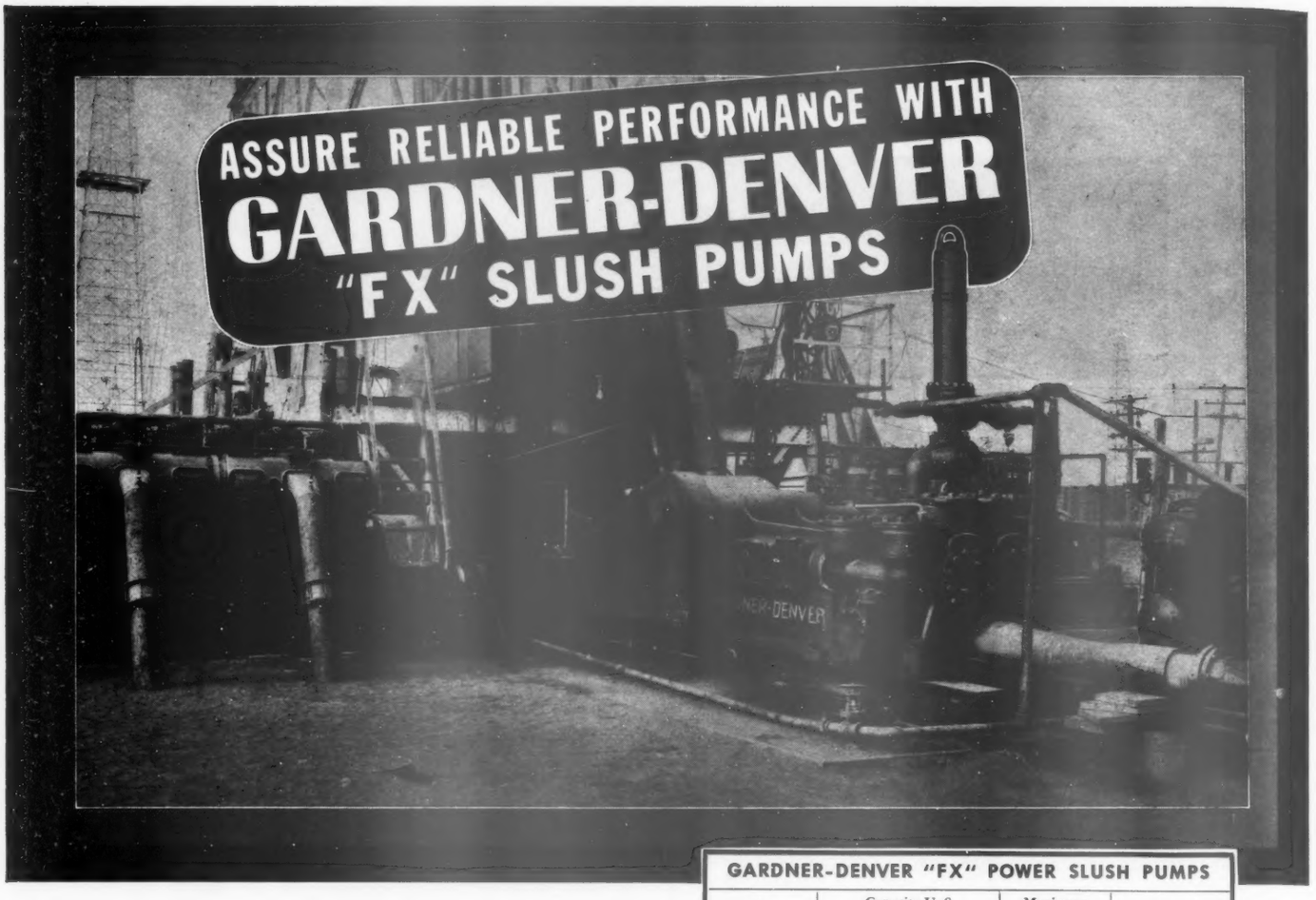
The hinged feature assures that the top of the Kinzbach Whipstock will lay back against the pipe at all times. The setting method allows it to be removed from the hole if necessary. The design permits its orientation in the hole to mill out in any desired direction.

KINZBACH TOOL COMPANY, INC.

HOUSTON, TEXAS, U. S. A.

California Representative: S. R. BOWEN COMPANY
EXPORT OFFICE: 74 Trinity Place, New York City

KINZBACH



GARDNER-DENVER "FX" POWER SLUSH PUMPS			
Size	Capacity U. S. Gallons per minute	Maximum Pressure	B. H. P.
7¼ x 10	450	365	100
7¼ x 12	495	470	150
7¼ x 14	577	550	200
7¾ x 16	693	575	250
7¾ x 20	774	800	400

All sizes may be furnished with reduced sizes of liners and pistons for higher pressures.

The oil industry has never compromised with the reliable performance of its equipment. That is why so many experienced buyers have chosen the GARDNER-DENVER "FX" line of slush pumps. Here are some of the reasons for their choice:

FIRST —Divided fluid cylinder construction—no inner baffles or metal sections to be cut through by mud.

SECOND —Regular equipment includes SLUSH-PROOF hardened liners and rods—SLUSH-PROOF valves of the dual-seating type.

THIRD —Automatic, positive flood lubrication to all working parts eliminates oil pipes and complicated adjustments.

FOURTH —Oil-stop and mud-stop heads prevent entrance of mud and water into power end.

FIFTH —Main power frame is a rugged, one-piece casting designed for severe shock loads.

We shall be glad to send you complete details concerning the mechanical features. Write today. Address your letter to Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

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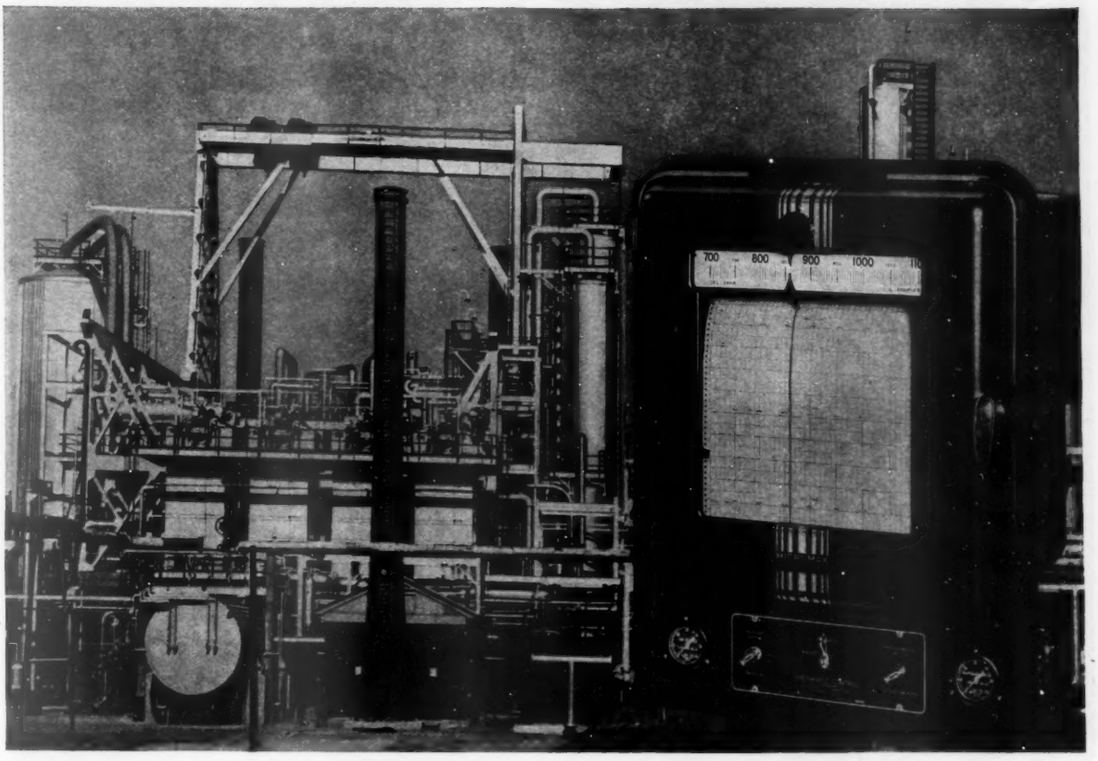


THERE'S *Nothing* TO ADD To Your MICROMAX Controller

Every setting that any pyrometric control can use in a refinery, is built into a Micromax Pneumatic Controller as an integral part.

We don't have to know what type or make of valve the Controller is to handle—what type of unit it's to go on—how much load-swing you anticipate—or how much lag. Every Micromax Controller is completely adjustable to any of these problems. Just give us the type of couple, range of calibration and range of pressure in the plant's air-supply. The resulting instrument will help you secure control of unsurpassed sensitivity, accuracy and dependability. For details, see Catalog N-OOB.

LEEDS & NORTHRUP COMPANY, 4959 STENTON AVE., PHILA., PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Jrl Ad N-33A-702(33)

NEW FISHER

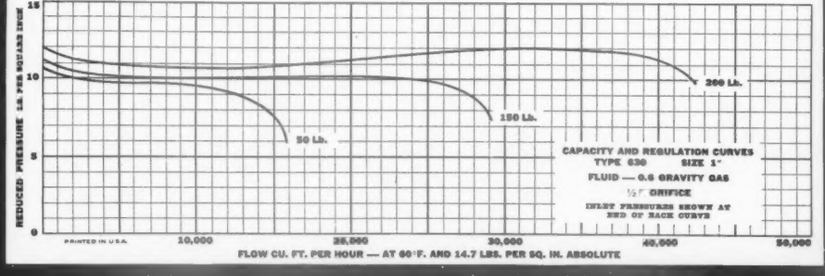
Type 630
POUNDS TO POUNDS
REGULATOR

BETTER REGULATION OF HIGH OR INTERMEDIATE GAS PRESSURE REDUCTION! . . . For Primary Pressure Reduction in Farm Taps from High Pressure Transmission Lines; Also Highly Recommended for General Applications in Refineries and Gasoline Plants!

LARGE CAPACITY . . plus CLOSER REDUCED pressure regulation are outstanding advantages of this new Fisher Regulator. A built-in pressure loading feature makes it possible to automatically maintain desired reduced pressure regardless of inlet pressure fluctuations or demand load increases. Actual tests show this regulator has greater capacity, size for size, than any other regulator of its type built today. Note typical capacity curves below. . . Two interchangeable diaphragm assemblies are available on all sizes — for 0 to 30 lbs. and 25 to 150 lbs.

SIZES and PRESSURES . . 1", 1¼", 1½" and 2" with three orifice sizes ¼", ⅜" or ½". Suitable for inlet pressures up to 1,000 lbs. per square inch.

Write for new bulletin 43-D . . . gives complete specifications and prices.



FISHER GOVERNOR COMPANY
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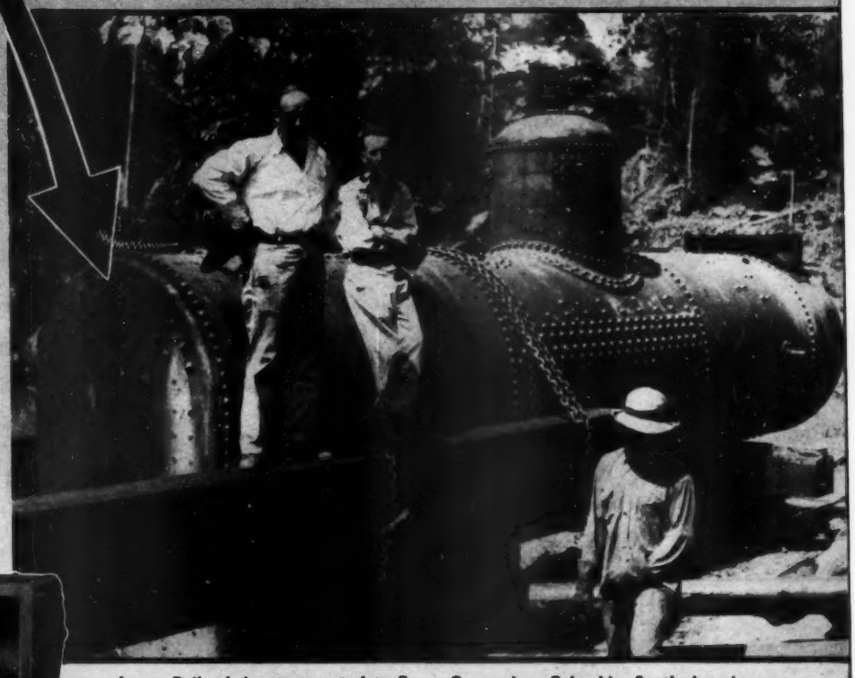
MARSHALLTOWN, IOWA

LUCEY *Efficiency and Portability*

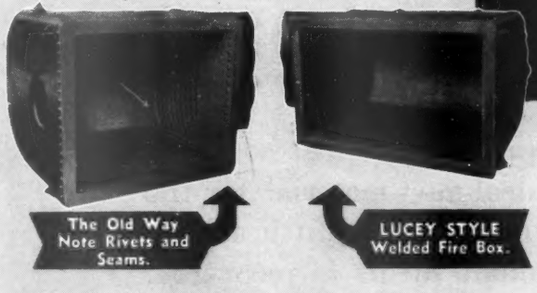
an ASSET in SOUTH AMERICA

Climate and Geography present no barriers for Lucey Boilers. Their Efficiency, Light Weight, and Easy Portability attest their Unique Design and Master Workmanship which qualify them for Oil Country Use anywhere in the world.

The All Welded Fire Box, introduced by Lucey, has increased rapidly in use and popularity. Under scientific tests their A.P.I. Rating of 104 H.P. has maintained a 132 H.P. Rating without increasing the firing rate; cutting drilling costs, reducing drilling time, through consistent, uninterrupted performance.



Lucey Boiler being transported to Barco Concession, Colombia, South America.



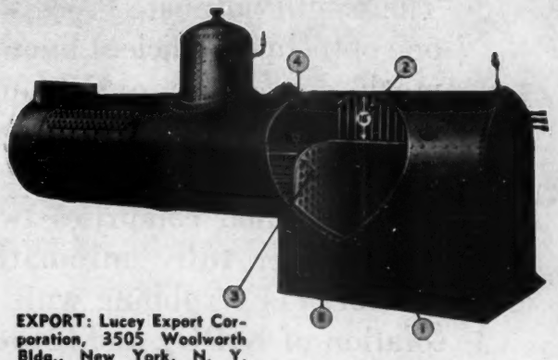
The Old Way Note Rivets and Seams.

LUCEY STYLE Welded Fire Box.

LUCEY BOILER FEATURES:

1. All-Welded Fire Box, No Rivets to Overheat or Burn. No Leaky Seams.
2. 18" Between Crown Sheet and Outside Wrapper (never less). Plenty of Steam Space with two gauges of water.
3. Arched Crown Sheet, Large Corner Radii. Good Staybolt Threads. Stronger Construction, Easy Cleaning, Better Combustion.
4. Short Tubes (13 ft.) in Vertical Rows. Effective Heating Surface.
5. 4" Water Space all around the Fire Box. Good Water Circulation.
6. Rating—A.P.I.—104 H.P.—Actual Field Test—132 H.P.
7. Weld between rows of Staybolts as specified by the A.S.M.E. Boiler Code and placed far enough away from the corners to insure the benefit of the cushion effect of the corner flanges.

WRITE FOR BULLETIN No. 141-1 on Boilers



EXPORT: Lucey Export Corporation, 3505 Woolworth Bldg., New York, N. Y. Broad Street House, E. C. 2, London, England.

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LUCEY BOILER *and* MANUFACTURING CORPORATION

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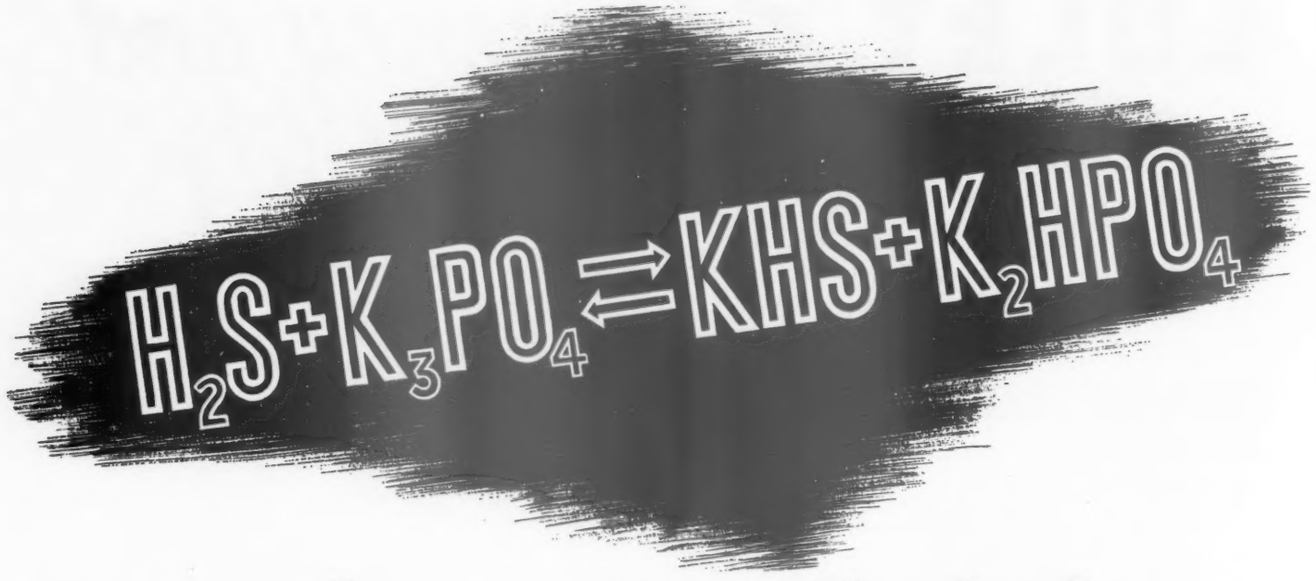


– a low cost method of removing and recovering H_2S from butane and propane

The Shell Phosphate Process is one of the most efficient known methods for removing and recovering H_2S from the low-boiling hydrocarbons.

The method comprises two steps under fully automatic control: (1) scrubbing with a solution of K_3PO_4; and (2) regenerating the spent solution. An ideal raw material for the manufacture of sulfuric acid or elemental sulfur is recovered.

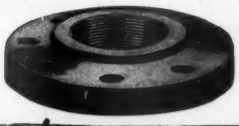
The Phosphate Process may be licensed by arrangement with Shell Development Company, 100 Bush Street, San Francisco. Write for information.

SHELL

SHELL DEVELOPMENT COMPANY

DROP FORGED FOR SAFETY AND ECONOMY TO MEET THE MOST TRYING CONDITIONS

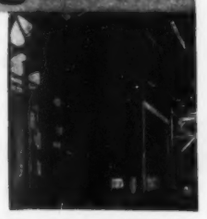
Valves, Fittings and Flanges by Vogt — the choice of operating men everywhere for safe and sure regulation of the high pressure and high temperature liquids and gases used in modern process work.



Vogt PRODUCTS are

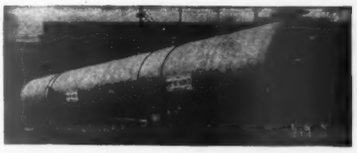
HIGH OPERATING EFFICIENCIES AND LOW MAINTENANCE COSTS

More steam per dollar of investment—because Vogt Boilers are designed and built to fit in with specific operating conditions. Available in bent tube, sectional header, box header and return tubular types using coal, oil, gas or waste heat for fuel.



DESIGNED to RAISE

MEETING THE DEMANDS FOR OPERATING SECURITY



Vogt has every facility for the fabrication of stills, towers, continuous rotary filters, filter presses, oil chilling machines, heat exchangers, etc., and these products are serving the petroleum industry around the world.

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TO COMBAT CORROSION AND PREVENT PRODUCT CONTAMINATION

Process equipment made from special metals and alloys for the exacting service of the chemical plant is fabricated in our modern shops for many of the well known chemical companies.

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STEPS TONNAGE UP AND COSTS DOWN

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"Most Complete Line of Tongs in the World"

Catalog 40, furnished on request, fully describes these and other PETOL and TITAN Tools.

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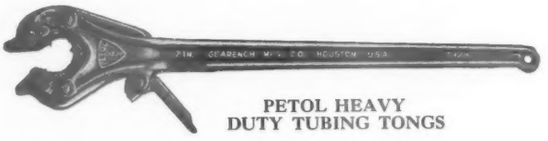
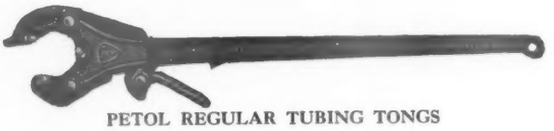


PETOL HEAVY DUTY TUBING TONGS

TITAN PIPE TONGS



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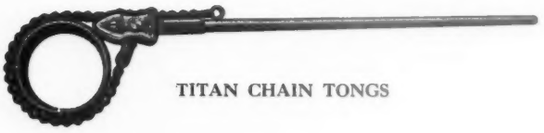
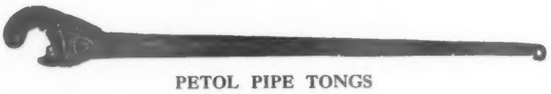
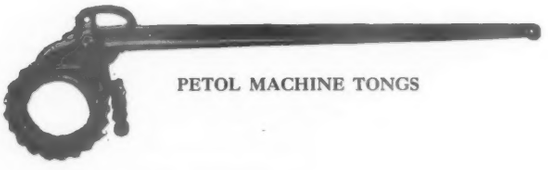


TITAN CHAIN TONGS



PETOL PIPE TONGS

TITAN REVERSIBLE CHAIN TONGS



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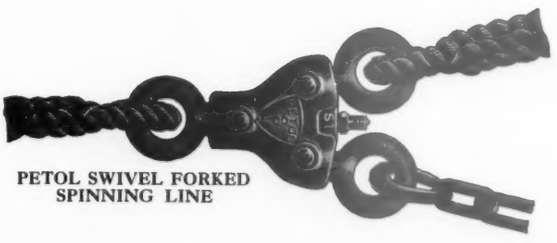

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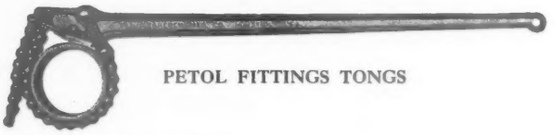

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PETOL BULL TONGS

TITAN FLANGE SPREADER

26 TYPES
276 SIZES

PETOL TOOLS TITAN TOOLS

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HOUSTON, TEXAS, U.S.A.
EXPORT OFFICE: 1 PARK PLACE, NEW YORK, N.Y.

. . . DESULPHURIZATION . . .

The Girbotol Process removes hydrogen sulphide so economically from sour gas that it is often less expensive to purify than to use more distant supplies of sweet gas . . . We'd be glad to cite you some examples. Address:

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Gas Processes Division

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Incorporated

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The Quality Seal on Seamless Steel

"From Pig to Finished Product"

TO make a high quality steel product, the steel itself must be right. That is why Harrisburg makes its own Alloy, Carbon and special Steels. That is why the company's Metallurgical Department supervises the open hearth so that each heat of steel meets the specifications demanded by the Engineering Department for each particular product. Accordingly, Harrisburg makes sure its products are right from the start -- right because supervision starts with the pig and ends only at the points of shipment.

Harrisburg Billets and Slabs are furnished in round-cornered and square-cornered forgings and re-rolling sizes of high and low carbon S.A.E. and special alloy steels.

Harrisburg Seamless Steel Cylinders are plate-made. This means uniformity of side walls and bottoms. There are no thin spots and leaky bottoms in Harrisburg cylinders. Harrisburg cylinders are made in standard-weight manganese and lightweight chrome molybdenum.

Harrisburg Seamless Steel Pipe Couplings are forged from a solid billet. Threads are treated by a special process which gives them unexcelled accuracy in form, height, angle and lead. The threads will not gall under the severest strain and are proof against stripping. Made of prime steel from Harrisburg's own open hearth furnaces.

Harrisburg Pump Liners are forged seamless from steel of special alloy composition. Made by the new and exclusive Nelsonizing

Harrisburg Steel

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process whereby the inner surface can be raised -- for almost any desired depth -- to a Brinell hardness as high as 625, whereas the outer surface can be maintained for any predetermined depth of a Brinell hardness of 200 to 250. No metal spraying is used, nor alloy inserts; nor is case hardening or other surface preparation resorted to. Harrisburg slush pump liners possess maximum hardness where most needed, backed up with material made tougher and more ductile.

Harrisburg Seamless Steel Liquefiers are formed from Harrisburg's own special analysis steel and processed by specially designed machinery. There are no moving parts, and precisioned threads assure easy opening and closing. The Harrisburg patented closure is guaranteed not to leak at any pressure. All parts are accurately machined and these liquefiers meet demands in excess of Federal and State requirements.

Harrisburg Drop Forgings are furnished in steel of any analysis and to any specifications. Harrisburg is equipped with a battery of steam drop-forging hammers, die-making machines and a complete heat-treating department. Harrisburg makes some of the most difficult forgings, whose accuracy and alignment are of first importance.

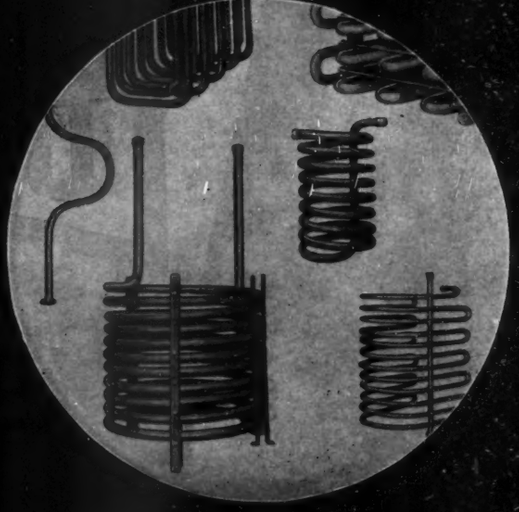
Harrisburg Steel Pipe Flanges have a wealth of extra ruggedness, but their threads are so carefully machined that they set an entirely new standard of how perfect a flange can be. Threads must stand a careful test as to fullness and uniformity -- perfection in height, angle, taper and gaging. All types and sizes.

Harrisburg Bull Plugs are made by the seamless process and are not welded. Hence, there is no "pipe" or lamination to develop leaks. Threading on Harrisburg bull plugs is clean and holds firmly without stripping.

Harrisburg Pipe Coils and Bends are manufactured to suit every conceivable purpose. Every coil and bend is thoroughly tested before leaving the plant and is guaranteed to meet customer's specifications. We manufacture coils for refrigeration and distilling plants, packing houses, chemical plants, powder works, oil refineries, and for many other purposes.

Send for your copy of the new Harrisburg catalog, containing 96 pages of informative and interesting data. A copy free when requested on your letterhead.

Corporation HARRISBURG PENNSYLVANIA



LUNKENHEIMER SERVES THE OIL INDUSTRY

with a complete line of valves for steam, water, air, gasoline and oil service. Immediately available from Lunkenheimer distributors in all oil centers.

Bronze

Fig. 1878

Iron

Fig. 1430

Steel

Fig. 1938

Ask for Catalog 78 and handy "Guide" for selecting Valves, Boiler Mountings and Lubricating Devices. Your Lunkenheimer distributor will be glad to give you copies.

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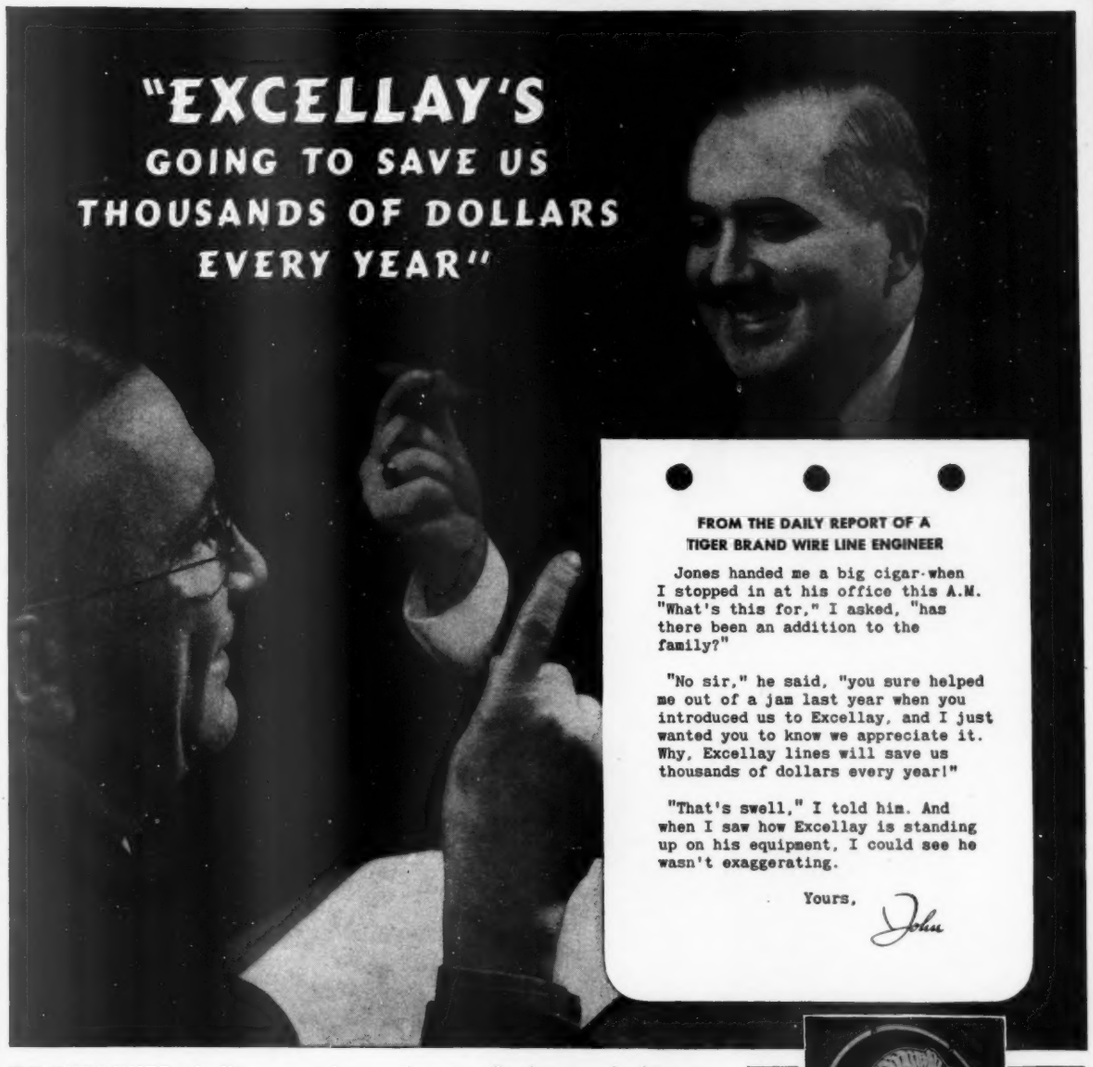
LUNKENHEIMER

"EXCELLAY'S GOING TO SAVE US THOUSANDS OF DOLLARS EVERY YEAR"



FROM THE DAILY REPORT OF A TIGER BRAND WIRE LINE ENGINEER

Jones handed me a big cigar when I stopped in at his office this A.M. "What's this for," I asked, "has there been an addition to the family?"

"No sir," he said, "you sure helped me out of a jam last year when you introduced us to Excellay, and I just wanted you to know we appreciate it. Why, Excellay lines will save us thousands of dollars every year!"

"That's swell," I told him. And when I saw how Excellay is standing up on his equipment, I could see he wasn't exaggerating.

Yours,
John

WHEREVER wire lines are used, you can be sure that not far away is one of the arms of the American Steel & Wire Company, the Tiger Brand Wire Line Engineer.

What these men accomplish is no mystery to the thousands of wire line users they contact every year. They know your problems, they talk your language. Their job is to help you select the best wire line for a given task—to help you put wire line to the most effective use—in short, to help you get a full dollar's worth of performance out of every dollar you invest in wire lines.

Get to know your American Tiger Brand Engineer better. He's in position to give you practical, down-to-earth, money-saving assistance. If for any reason you are not being contacted by one of these engineers, write or call us and you'll learn the true meaning of real wire line service.

LOOK FOR THE TIGER. *Buy Excellay Preformed wire lines from the distributor who displays this sign.*

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York

COLUMBIA STEEL COMPANY
San Francisco

United States Steel Export Company, New York

UNITED STATES STEEL

PYROLYTIC CRACKING . . . the BACKBONE of the REFINERY

The most widely used of the various pyrolytic cracking processes licensed by this organization is the Combination Cracking Process.

Developed for processing crudes to completion in a unitary operation, it enables the refiner to utilize to a large degree the surplus heat from the cracking system, reduce operating costs per unit of fresh feed capacity, minimize the handling of intermediate products and secure maximum yields of high quality products.

The ability to quickly, economically and profitably vary finished products and feed stocks to take advantage of market conditions of the moment is a distinct economic advantage.

Review the records of modern pyrolytic cracking units before investing in new plants.

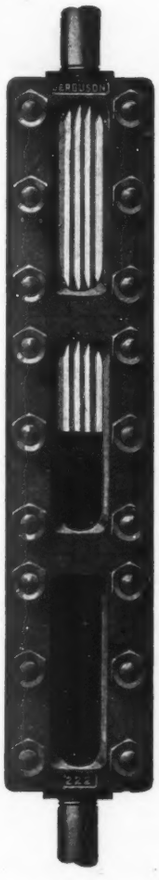
GASOLINE PRODUCTS COMPANY, INC.

26 Journal Square · Jersey City, New Jersey

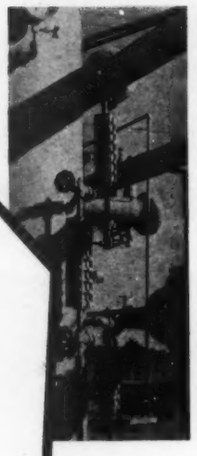
LICENSES granted under United States and Foreign Patents for: Cross, de Florez, Holmes-Manley, Tube and Tank Cracking Processes, Uni-Coil Injection Process and Combination Cracking Units
Licensing Agents: THE M. W. KELLOGG CO., Jersey City, New Jersey, or its *European Representative:* COMPAGNIE TECHNIQUE des PETROLES, 134 Boulevard Haussmann, Paris, France

JERGUSON

Gages



REFLEX GAGE



HIGH VISIBILITY *Yes* but Complete Safety, Too

It's nothing for Jerguson Gages to function week after week at high temperatures — on those long "on stream" record runs — without showing any signs of failure.

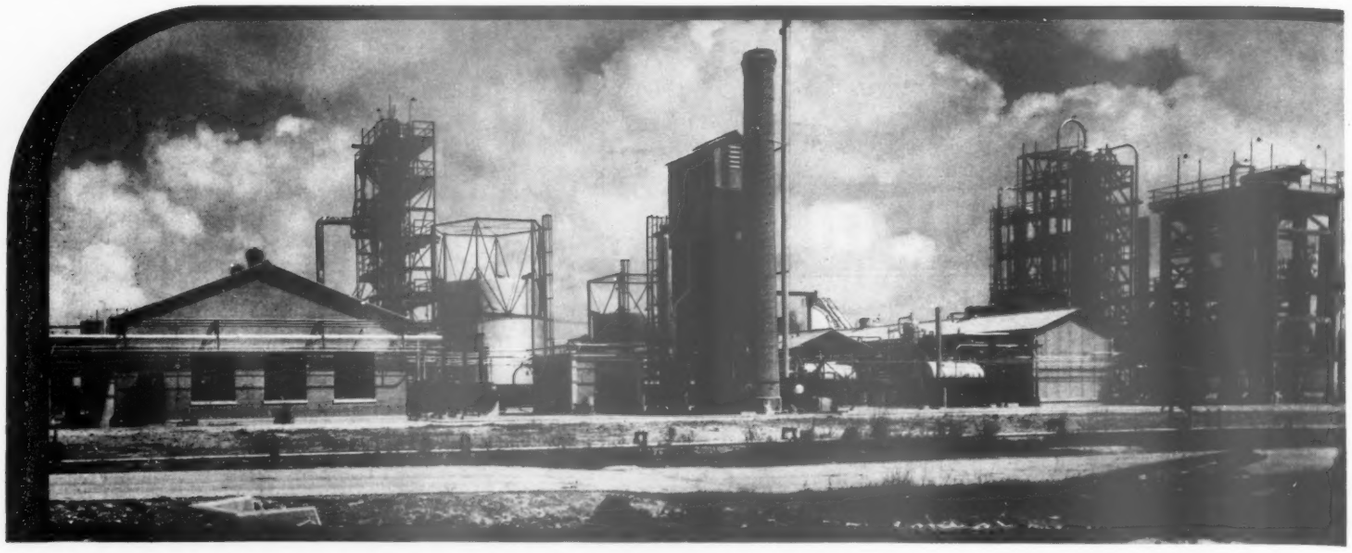
No ordinary glass could withstand these conditions. It takes the special, high-quality, carefully annealed glass such as is standard in all Jerguson Gages.

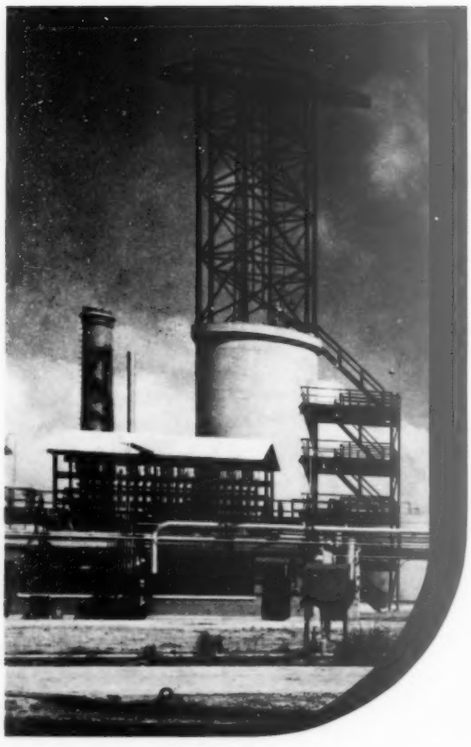
Glass selected for gages is by no means the least important item in the assembly. With Jerguson Gages it is one of the most important.

Write for catalog

JERGUSON GAGE & VALVE CO.

85 Fellsway Somerville, Massachusetts





ENGINEERS DON'T GAMBLE...

they know

Carey HEAT INSULATIONS

ARE A GUARANTEE OF TOP PERFORMANCE

PETROLEUM engineers know that correct insulation is essential to the amazing efficiency of the modern refinery. They know that time-proved products must be used to insure this efficiency. Too much is at stake for them to gamble or experiment.

This is the reason why CAREY Insulations are so widely used by those engineering specialists who serve the oil industry. They know the inside story of every product that goes into their jobs—and they know that CAREY Insulations are a guarantee of the performance they must attain.

The photo shows a refinery designed and built by The Lummus Company —one of the foremost organizations specializing in the petroleum field. CAREY Insulations were specified for top performance—permanence—thorough dependability.

Engineers don't gamble on insulations. Why should you? Use CAREY Insulations and play safe. Over a half century of manufacturing experience is back of their success.

Write today for Insulation Catalog—address Dept. 34.

THE PHILIP CAREY COMPANY • *Lockland, Cincinnati, Ohio*

Dependable Products Since 1873

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Carey Magnesia-Asbestos HEAT INSULATIONS

Equipment Manufacturers and Operators Prefer Diamond Roller Chains

● Along with the advances in oil field machinery developments, the need for greater speeds, deeper holes, higher efficiencies—DIAMOND Roller Chains for drilling, pumping, and servicing power rigs, for winches, tractors, trenchers, etc. have more than met the changing requirements of the last 20 years.

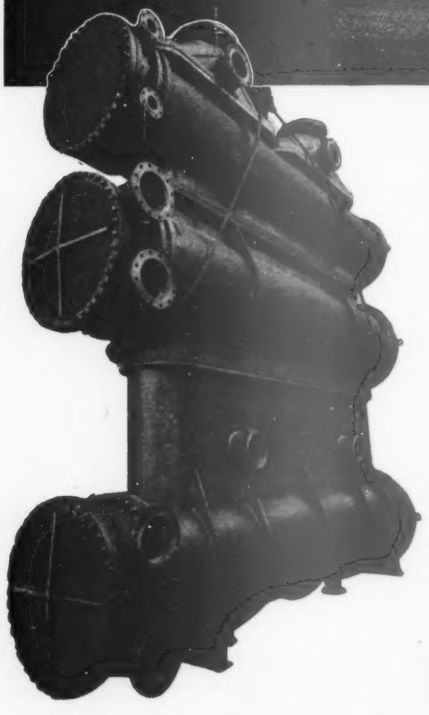
● Leading manufacturers of equipment and experienced operators well know that DIAMOND Drives are the "Preferred Power Drives" of the industry,—that they have demonstrated their reserve power, high power transmitting efficiency, dependability, and ease of application and maintenance. They are used in all the important oil fields of the United States and the world,—used more extensively than any other drive chain... DIAMOND CHAIN & MFG. CO., 441 Kentucky Ave., Indianapolis, Indiana. Tulsa Office: 475 Terwilleger Blvd.

DIAMOND ROLLER CHAINS

50th Anniversary *1890-1940*

IT'S THE DRIVE YOU USE THAT MAKES THE DIFFERENCE

Two Trainloads of Kellogg-built Heat Transfer Equipment for One Refinery



Verified plant records, covering long periods and involving unusual and severe operating conditions —including wide variations in pressures and temperatures—prove beyond question the efficiency, economy and durability of Kellogg-built heat transfer equipment.

Kellogg-designed and Kellogg-built heat exchanger and condenser equipment is efficient, economical and long lived because Kellogg engineers are thoroughly familiar with the many heat transfer problems encountered in refinery operation.

If you have a heat transfer problem the knowledge and experience of Kellogg engineers may assist you in its solution.

THE M. W. KELLOGG COMPANY · JERSEY CITY, NEW JERSEY · 225 BROADWAY, N. Y.

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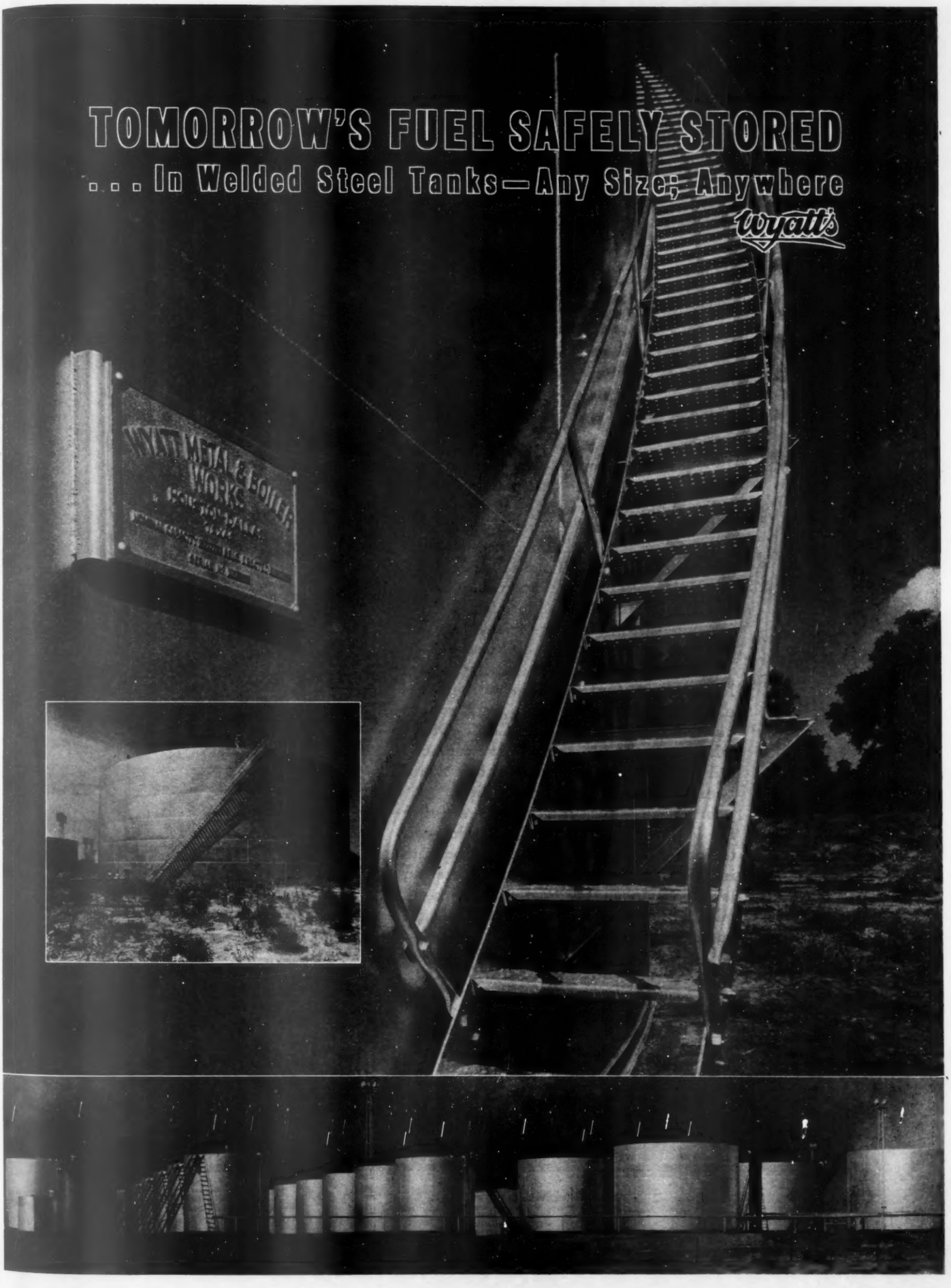
TOMORROW'S FUEL SAFELY STORED
. . . In Welded Steel Tanks—Any Size; Anywhere
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WYATT METAL & BOILER WORKS

16 YEARS OF CONSISTENT LOW COST PRODUCTION

In 1924—16 years ago—Gray Clay Treating Units were first placed in commercial operation.

Since that time Gray Clay Treating acceptance has increased until today it is widely used by all classes of refiners. That's largely because it consistently fits the requirements of refiners for economically treating gasolines in conjunction with a large variety of cracking processes.

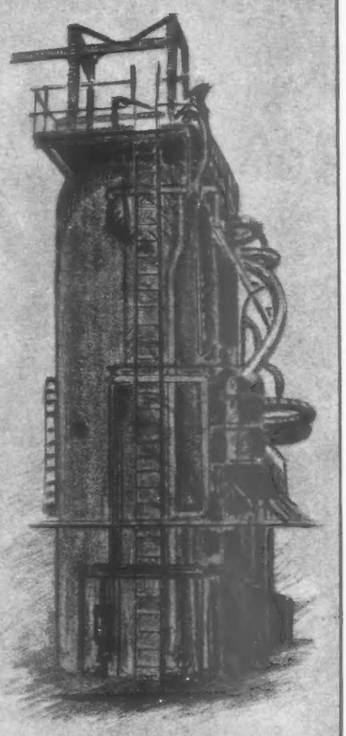
Gray Clay Treating Units will produce low gum content gasoline without loss of octane number. They will last throughout the life of the cracking unit. Often, when new cracking units have replaced old ones, the Gray Process has again been chosen to treat the gasoline.

In these days, the refiner striving for low cost production, will do well to consider the Gray Process. Moderate installation costs, negligible operating labor expense, low cost of adsorbent, minimum maintenance, are all definite economic advantages.

THE GRAY PROCESSES CORPORATION

Licenses granted under United States and Foreign Patents by The Gray Processes Corporation

26 JOURNAL SQUARE · JERSEY CITY, NEW JERSEY

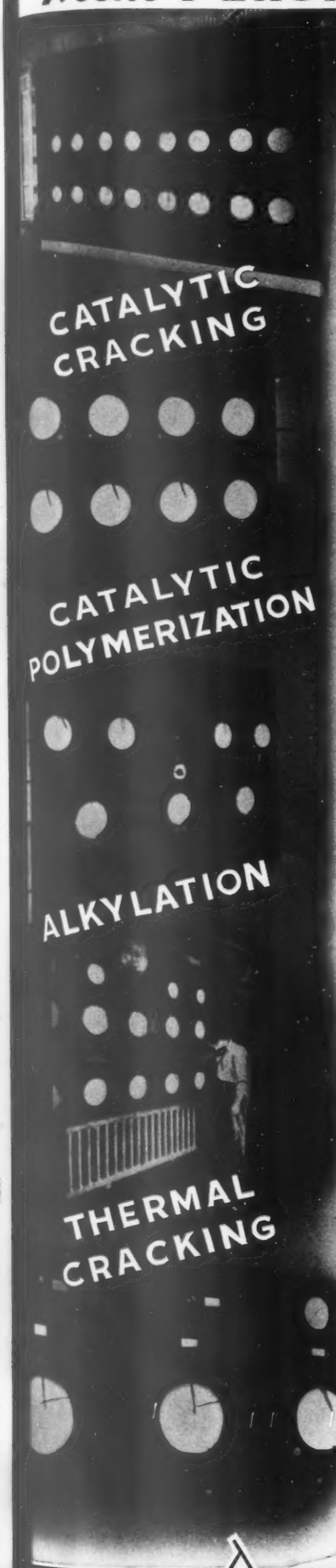


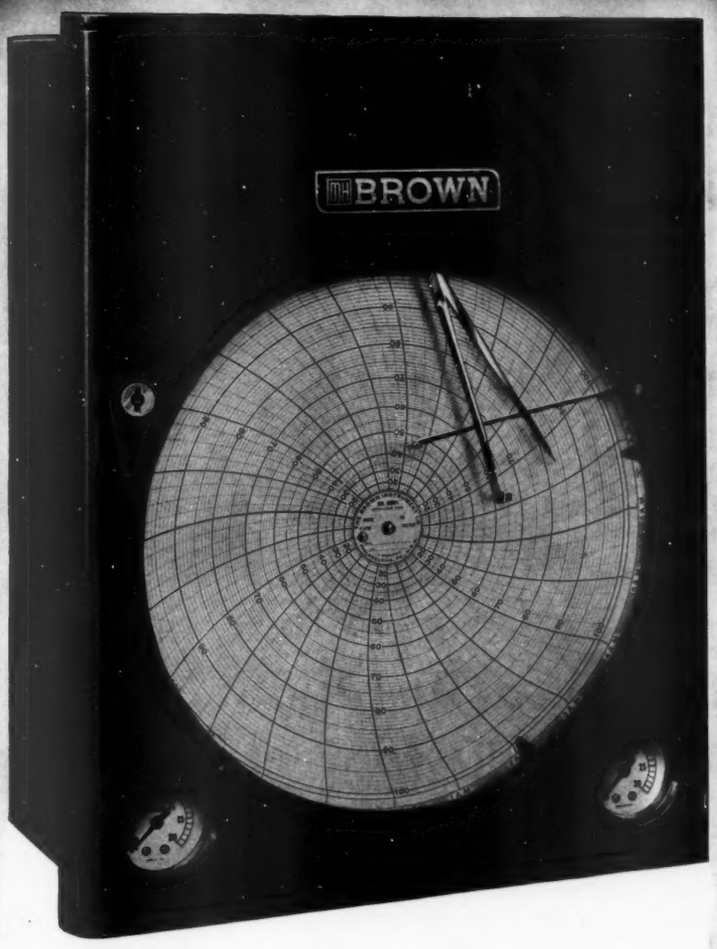
OVER 7 MILLION BARRELS

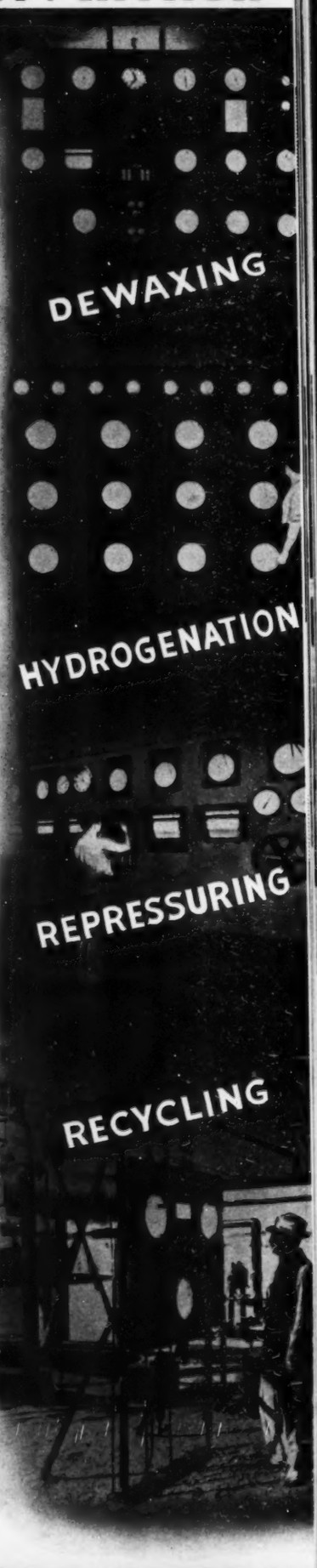
In 1926 a certain refiner installed a small Gray Clay Treating Unit. To date this unit has produced 7,655,000 barrels of low gum content gasoline.

GRAY CLAY TREATING

From PERSIA *to* PALEMBANG *to* PORT ARTHUR







Hundreds of Installations testify to Brown's world-wide acceptance

BUT!—back of these control panels is something which does not strike the eye—it is the "priceless ingredient"—it is a comprehension of the industry's problems—it is the ability to talk the refiner's language.

HERE is where Brown's engineers enter the picture—They have kept pace with progress in refining processes since the early days of simple distillation. You can rely on their experience—be confident in their recommendations for your specific problem.

Brown Instruments have won world-wide acceptance on the basis of extreme precision and dependable performance. For information on the Brown Line of Potentiometers, Pressure Gauges, Flow and Liquid Level Meters, Pneumatic, Transmission, etc., write THE BROWN INSTRUMENT COMPANY, *a division of Minneapolis-Honeywell Regulator Co.*, 4488 Wayne Avenue, Philadelphia, Pa. Offices in all principal cities. Toronto, Canada: 117 Peter Street—Amsterdam-C, Holland: Wijdesteeg 4—England: Wadsworth Road, Perivale, Middlesex—Stockholm, Sweden: Nybrokajen 7.

ELECTRIC • AIR OPERATED

BROWN INSTRUMENTS

AND MINNEAPOLIS-HONEYWELL CONTROL SYSTEMS

For Temperatures . . . . . Pressures . . . . . Flows . . . . . Liquid Levels

A Tribute to Cities Service from 57,000 feet underground

Read these testimonials from a famous drilling company—the italics are ours —the satisfaction is our customer's.

Drilling equipment is both expensive and sensitive. Therefore, lubrication is a particularly important item in its care. Thus, it is with particular pride that we offer the following endorsements from the Schoenfeld-Hunter-Kitch Drilling Company, of Oklahoma City, who have long used Cities Service diesel oils.

1. We are pleased to report we have drilled over 57,000 feet of wells using Cities Service Diesel Oil No. 6. We *have experienced no ring or bearing trouble* in our motors and at the present time the engines are in excellent condition.

2. Your diesel oils give us such satisfactory service we decided to add filters to our D-17,000 Caterpillar Drilling Units and use diesel oil in them. Again we are glad to say that we have *60,000 feet* of wells behind these units without lost time due to lubrication.

3. We changed oils in these diesel units approximately every 125 hours before trying Diesel No. 4. We now change oil every thousand hours but with only two gallons of make-up oil per day for the two motors.

Cities Service diesel lubricants are service proved. They have been tested—proved by years of service to be lubricants that give outstanding resistance to wear. Cities Service lubrication engineers have a wealth of experience in prescribing and checking results in the diesel lubrication field. You can draw on this background of experience to answer your lubrication problem. Consultation of the Lubrication Engineers Service is absolutely free.

CITIES SERVICE OIL COMPANIES

Sixty Wall Tower, New York

CITIES SERVICE OIL COMPANY—Chicago, New York, Cedar Rapids, Boston, St. Paul, Grand Forks, Kansas City, Fort Worth, Oklahoma City, Milwaukee, Cleveland, Detroit, Harrisburg, Syracuse.

CITIES SERVICE OIL COMPANY, LTD.—Toronto, Ontario.

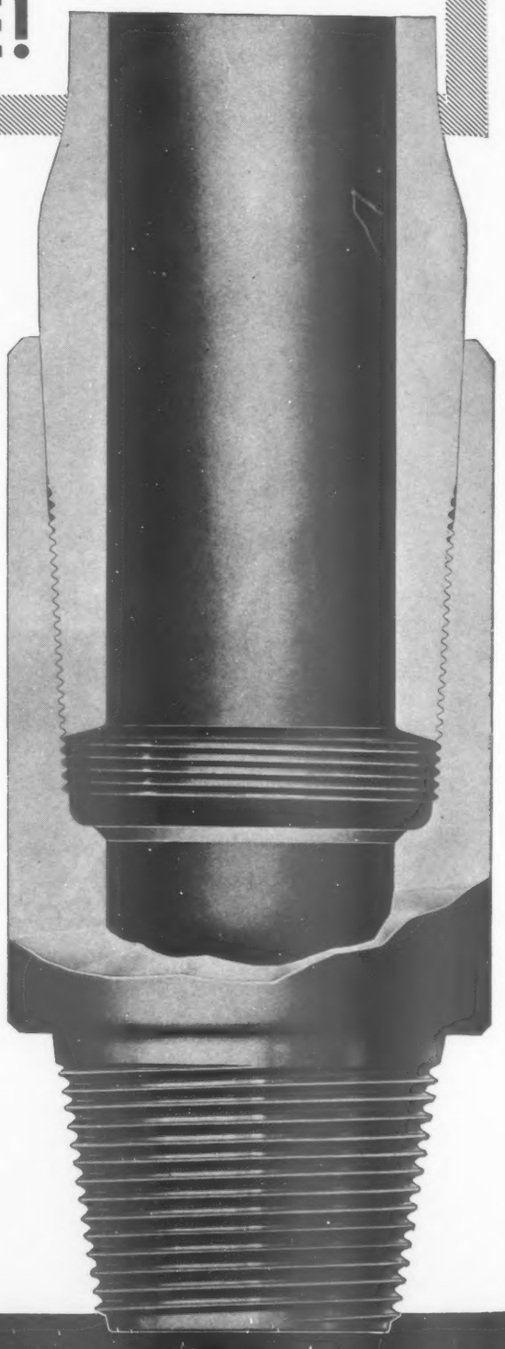
ARKANSAS FUEL OIL COMPANY—Shreveport, Little Rock, Jackson, Miss., Birmingham, Atlanta, Charlotte, N. C., Nashville, Richmond.

TULSA

12th INTERNATIONAL PETROLEUM EXPOSITION

MAY 16-23, 1942

5 convincing reasons for the swing to Pittsburgh Special DRILL PIPE!



1. GRIPPING SHOULDER TAPERED IN EXACT ALIGNMENT WITH THE THREADS

This special (patented) shoulder design positively and measurably increases the gripping power between the pipe and mating tool joint counterbore as the joint is tightened, preventing rocking in threads and minimizing effects of vibration.

2. 35% OR MORE *EXTRA* SHOULDER SEALING SURFACE

The additional contact surface provided by the extra "land" area results in a doubly positive seal that eliminates need for shoulder welding and gives added support to the last engaged thread—minimizing pipe end failure.

3. DEFINITELY GREATER STRENGTH

The combination of extra shoulder sealing surface and the shoulder tapered in alignment with the threads adds positively greater strength to the drill stem.

4. SPECIAL IN FEATURES—CONVENTIONAL IN USE

Since make-up is entirely conventional, replacements of worn joints can be made in any well equipped field shop at minimum cost. Thus Pittsburgh Special Drill Pipe often outlasts several sets of tool joints without removal from the field.

5. A. P. I. GRADES AND DIMENSIONS, *PLUS*

Conforms with A.P.I. specifications as to pipe sizes, grades of steel, lead, taper and form of threads, *plus* special features. Available in internal upset and external upset—internal flush; right or left hand threads. Mating tool joints obtainable from licensed manufacturers.

PITTSBURGH STEEL COMPANY

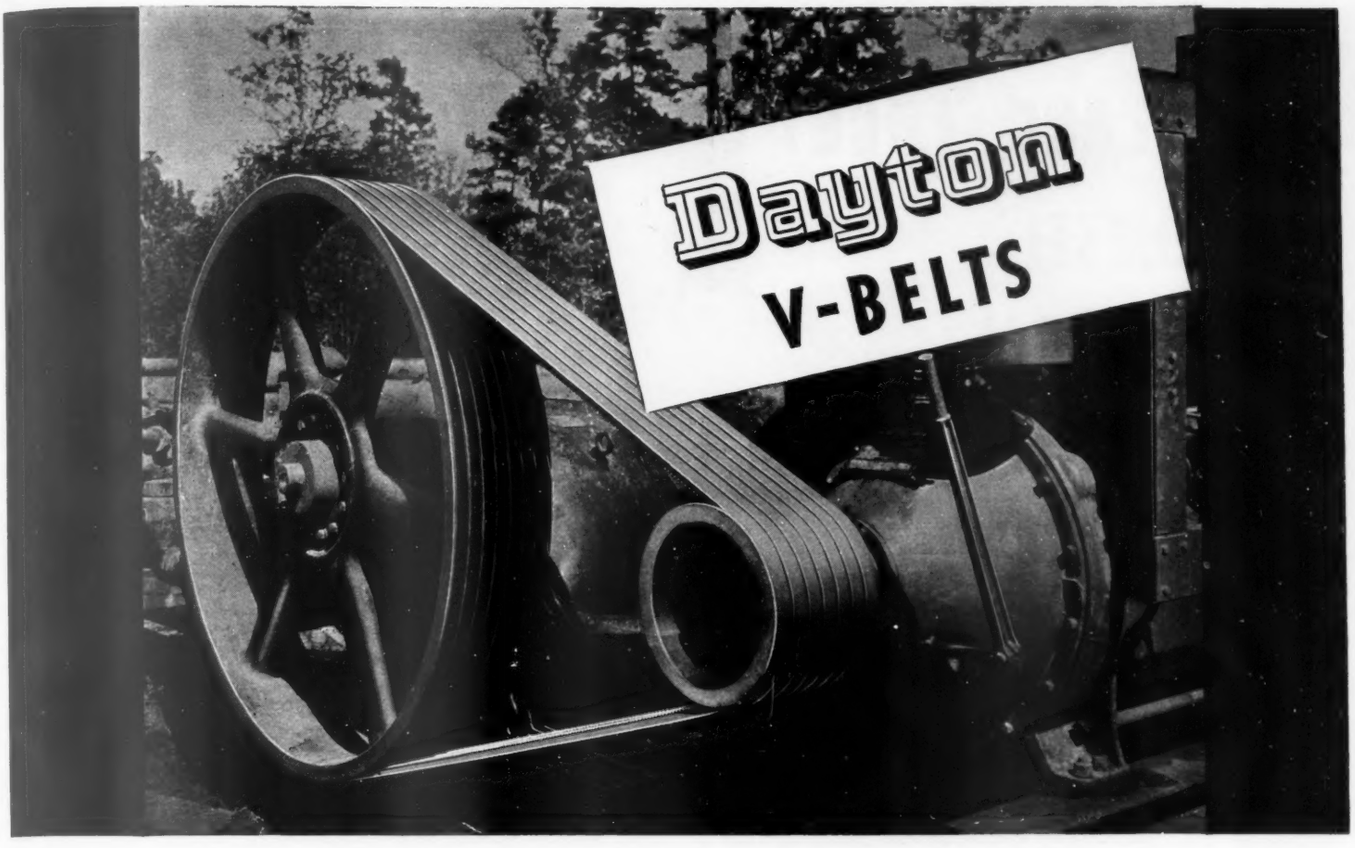
PITTSBURGH, PA.

NEW YORK • CLEVELAND • DETROIT • CHICAGO
TULSA • HOUSTON • LOS ANGELES

Pipe Storage Yards: Memphis, Tenn. Houston, Texas E. San Pedro, Calif.
Export Distributors: Lucey Export Corporation New York, N.Y., U.S.A.

Pittsburgh Special DRILL PIPE with the DOUBLE-GRIP JOINT

THERE IS NOTHING EQUAL TO SEAMLESS



COST LESS
Per-Month-of-Service!

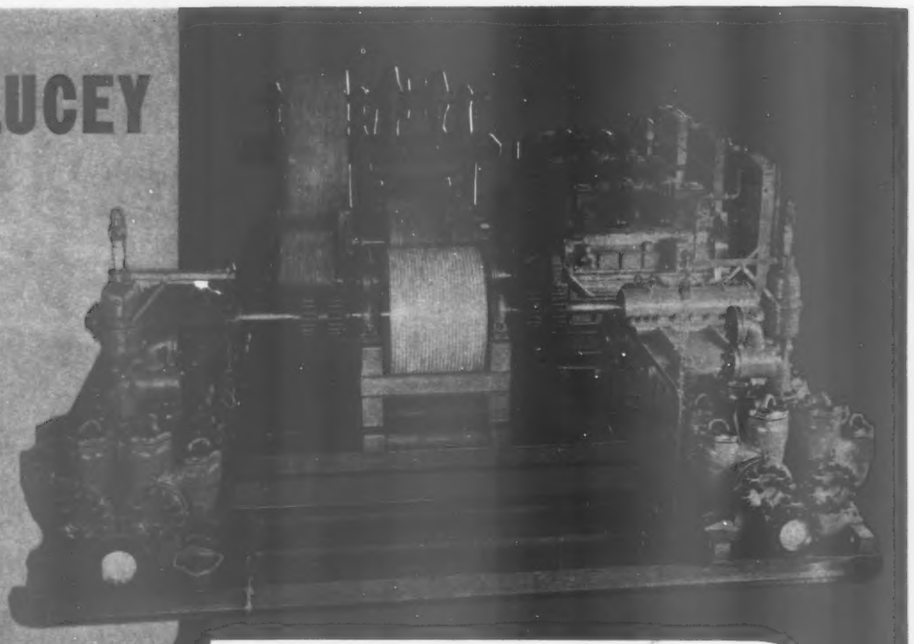
Dayton V-Belts cost less per-month-of-service because they are especially fortified to withstand the rigorous service and exposure conditions which are typical of the oil industry.

Oil industry applications of every conceivable type prove beyond question that cooler running Daytons do stand up longer under the strain of constant flexing to give you greater pulling power at less cost. These rugged, durable Dayton V-Belts are especially adapted to give smooth-flowing, economical power on drilling rigs, pumping units, slush pumps, central powers and varied applications in refineries.

Decide now to save your time, money and machinery by depending on V-Belts by Dayton and service by Continental.

THE CONTINENTAL SUPPLY COMPANY
GENERAL OFFICES: DALLAS, TEXAS

WHELAND - LUCEY
DIESEL ROTARY DRILLING EQUIPMENT



THIS Rotary Drilling Outfit is a Diesel-mechanical three-engine hook-up of rugged construction and capable of high-powered economical operation for drilling to a depth of twelve thousand feet. This hook-up is extremely flexible in operation and direction of power.

Upon request we will gladly furnish you with information on hook-ups to meet your particular requirements.

Lucey equipment has served oil operators throughout the world for more than a quarter of a century and our experience as pioneers in the design, construction and manufacture of rotary drilling equipment is your guarantee of safety, speed and economical drilling performance.

Suitable portable units for rotary drilling 2,500 to 5,000 feet can be supplied. We also manufacture a complete line of auxiliary equipment operated either in separate units or combinations of units.

The Wheland-Lucey HP-15000-CE 7¾" x 18" Power Slush Pumps shown are recommended for high pressure deep drilling and have many valuable features assuring you steady operation.

LUCEY EXPORT CORPORATION

3505 Woolworth Building, New York, N. Y.

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OIL WELL SUPPLIES

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You'll find

COLUMBIAN BOLTED STEEL TANKS

● For years Columbian has maintained a distinct leadership in superior tank design and construction.

This leadership was proved again when Columbian laboratories perfected COP-NIC with a special galvanized coating for Columbian Bolted Tanks, which makes them highly resistant to corrosive action and perfect for use in sour crude districts.

The sheets from which these tanks are made are of selected base material. An exclusive galvanizing process is used to put on a heavy coating of zinc spelter which is applied in such a manner as to become virtually a part of the steel itself, minimizing the possibility of any pitting or loosening of the coating. The unusual results obtained with these COP-NIC Galvanized Tanks are attributed to the process used in preparation of the sheets, of the coating, and the manner of fabrication which does not destroy or render ineffective the galvanized coating.

● **FREE CATALOG**—write now for your copy of the Columbian Tank Catalog giving complete information about COP-NIC and other Columbian Bolted Steel Tanks. Illustrated, informative—gives construction details and specifications.

COLUMBIAN STEEL TANK CO., P. O. Box G-4226, KANSAS CITY, MO.

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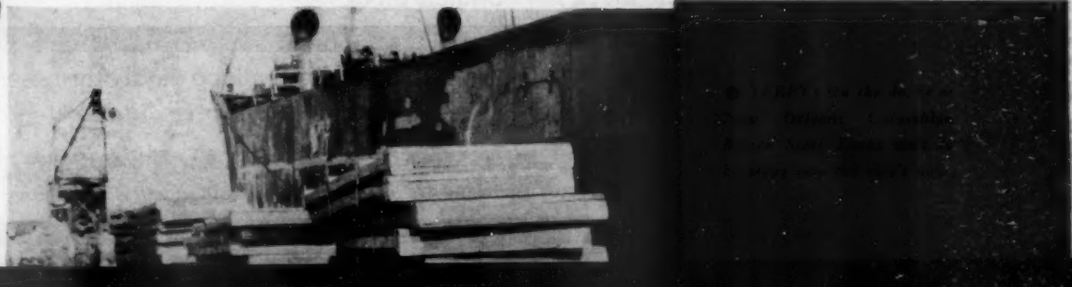

McKISSICK

BLOCKS
For Every Purpose

Tubing Block

Swabbing and Bailing Block

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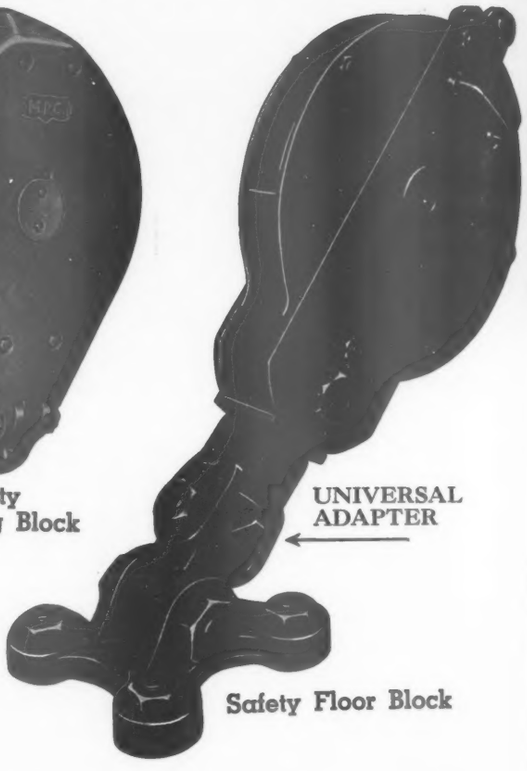
Safety Traveling Block



UNIVERSAL ADAPTER

Safety Floor Block

Construction Block

Tong Block

See 1941 COMPOSITE CATALOG for Complete Descriptions

Triple Traveling Block With Hook

Heavy Duty Snatch Block

Commander Snatch Block

Peerless Snatch Block

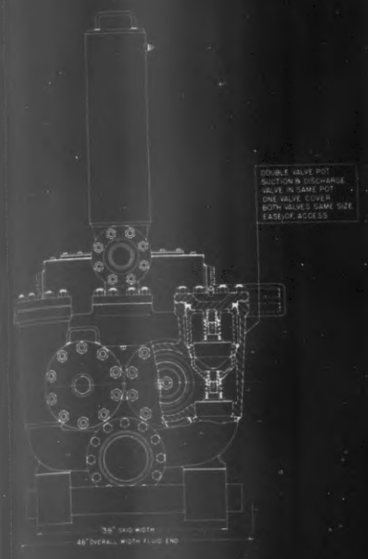
Quick Opening Snatch Block

Descriptive literature fully illustrated will be gladly furnished upon request.

McKISSICK PRODUCTS CORPORATION

TULSA, OKLAHOMA, U.S.A.

Export Division: A. V. Simonson, 149 Broadway, New York, N. Y.



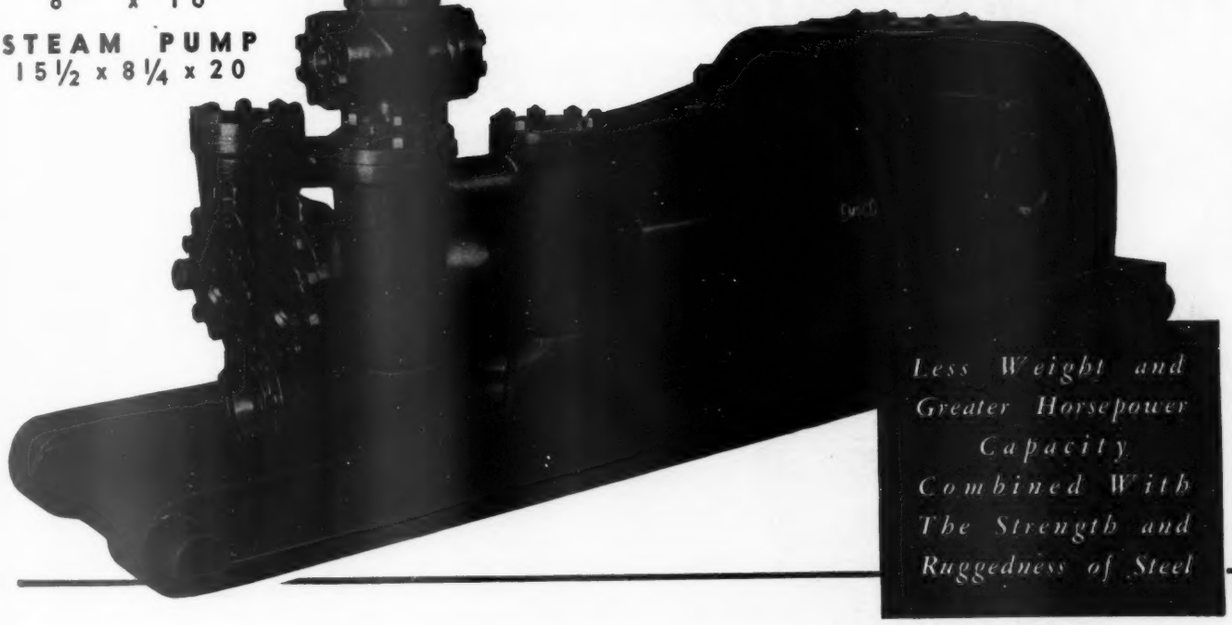
POWER PUMPS

5 1/2	x	8
7 1/4	x	12
7 1/2	x	14
7 3/4	x	16
8	x	16

STEAM PUMP

15 1/2 x 8 1/4 x 20

ALL STEEL CONSTRUCTION



Less Weight and Greater Horsepower Capacity Combined With The Strength and Ruggedness of Steel

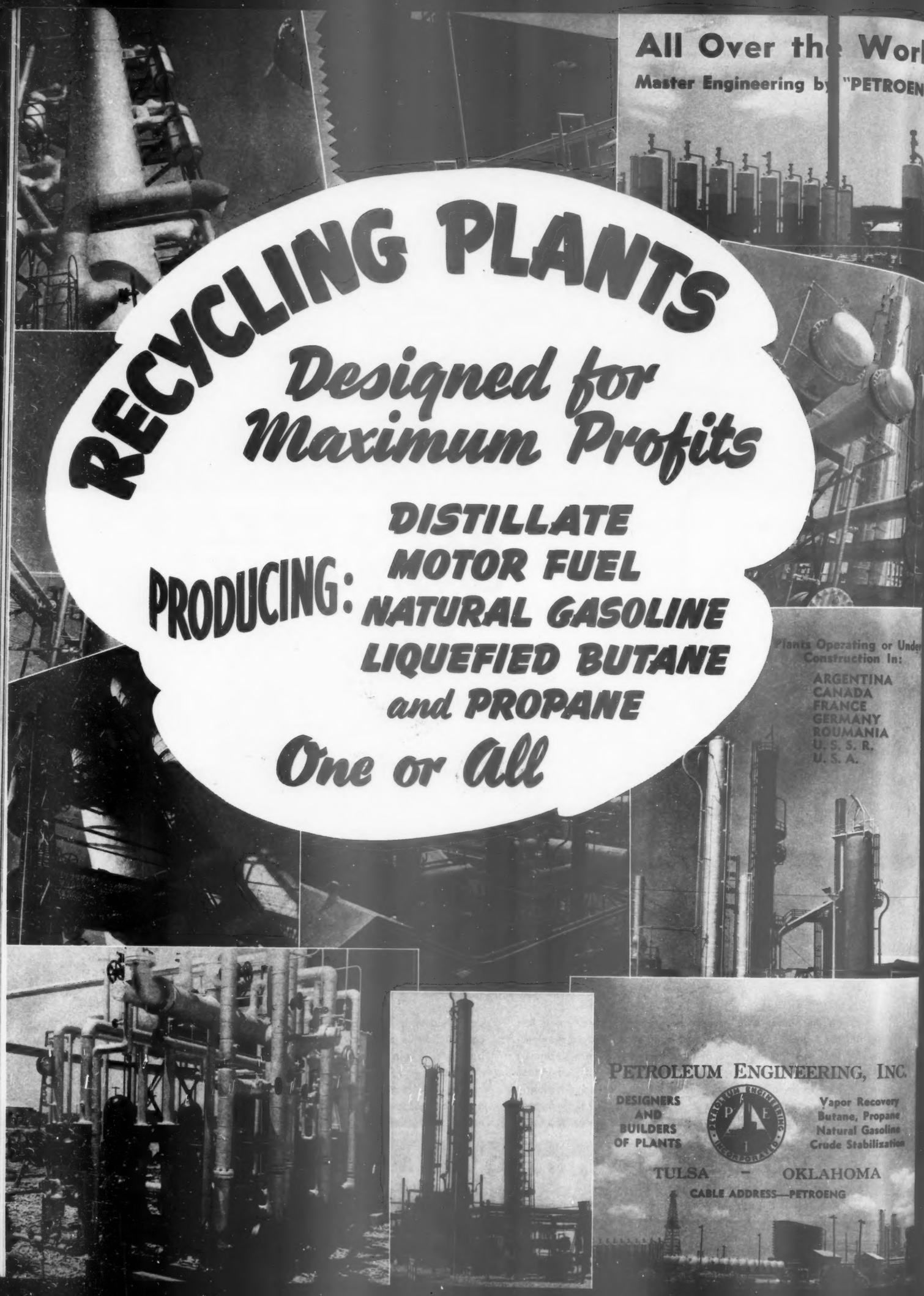
To build pumps with greater horsepower capacity and less weight for a given size than ever had been accomplished previously . . . that was the objective of Emsco engineers when designing these pumps. It was not a simple problem, but one of tremendous importance to the oil industry. How well they succeeded is clearly evidenced by the current types of Emsco advanced slush pumps.

Emsco pumps are all-steel; with fabricated power ends and steel fluid ends. Enormous reductions in weight over conventional construction is affected. Also, greater strength than ever has been available in this type of equipment.

Users express their approval of Emsco pumps by repeat orders. There are reasons . . . reasons that are vitally important to operators. Less weight combined with the strength and ruggedness of steel is only one. Others are illustrated above.

EMSCO DERRICK & EQUIPMENT COMPANY

Plants; Dallas • Los Angeles • Houston


All Over the Worl
Master Engineering by "PETROENG
RECYCLING PLANTS
Designed for
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MOTOR FUEL
NATURAL GASOLINE
LIQUEFIED BUTANE
and PROPANE
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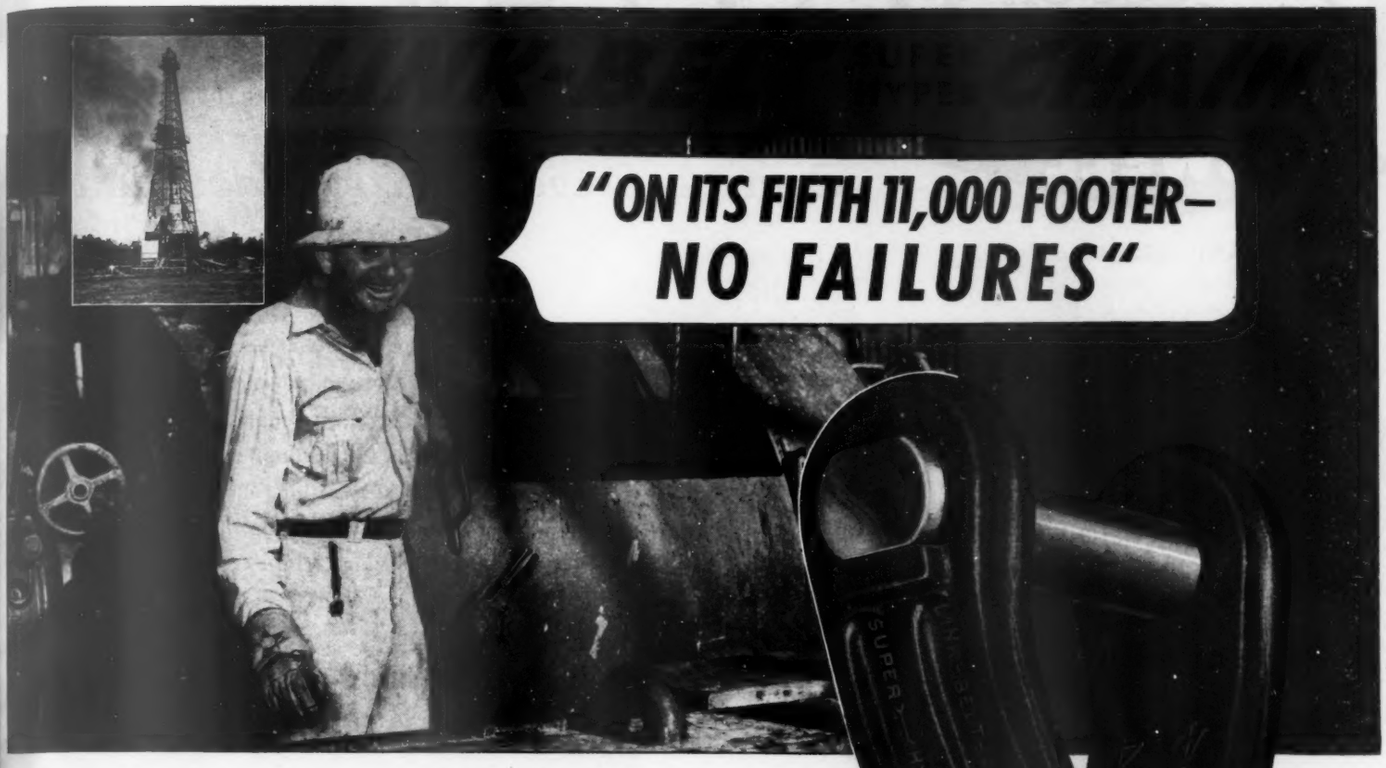
Natural Gasoline
Crude Stabilization
TULSA - OKLAHOMA
CABLE ADDRESS—PETROENG

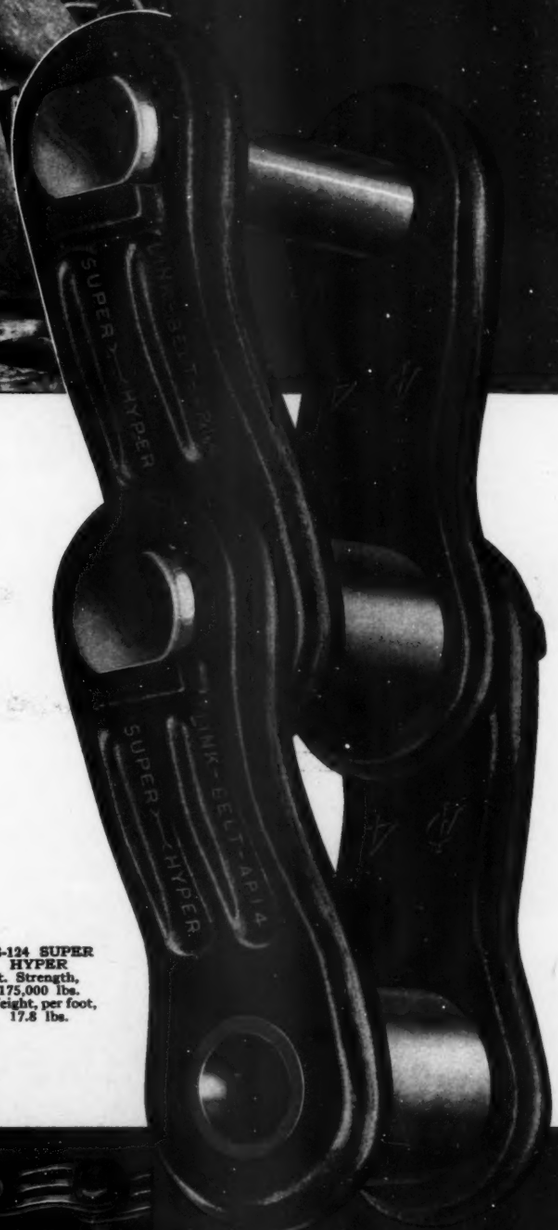


"ON ITS FIFTH 11,000 FOOTER— NO FAILURES"

● In this SUPER HYPER Chain, Link-Belt has taken a big step towards rotary chain perfection. Intensive research, based on over 65 years of chain making, has put into this highly improved drive all of the qualities necessary to combat the stresses and strains of today's and tomorrow's heavier loads and faster, deeper drilling. The design, materials and craftsmanship employed in producing SUPER HYPER Chain means greater strength, greater freedom from distortion, smoother performance, a more rigid and durable unit, and longer chain life. Yes, this patented heat treated drop forged side bar chain represents a marked improvement even over the original Link-Belt HYPER Chain which has hung up record after record for unusual performance in past years.

SUPER HYPER Chain first went into service at Sweeny, Texas, nearly one year ago, for test purposes, and is now completing its fifth 11,000-foot drilling job . . . with no failures. As a result of the excellent performance in this deep, tough drilling service, SUPER HYPER has created for itself a widespread demand where depths and loads call for a better chain.

Link-Belt SUPER HYPER, fully described in Folder No. OG-1857, is just one of the complete Link-Belt line of Rotary Chains, including a chain for every drilling job, regardless of depth or load requirement. Drillers everywhere know that any Link-Belt Chain means dependable performance, long-life service and low-cost operation.



SS-124 SUPER HYPER
Ult. Strength, 175,000 lbs.
Weight, per foot, 17.8 lbs.

LINK-BELT COMPANY

Indianapolis Houston Dallas Los Angeles Kansas City, Mo. Toronto

EXPORT SALES OFFICES:
Woolworth Bldg., New York, N. Y. *Cable and Radio Address:* "LINKBELT"
Distributors in all fields

8397

Look to **DOWELL**

OIL AND GAS WELL CHEMICAL SERVICE

FOR JELFLAKE . . .

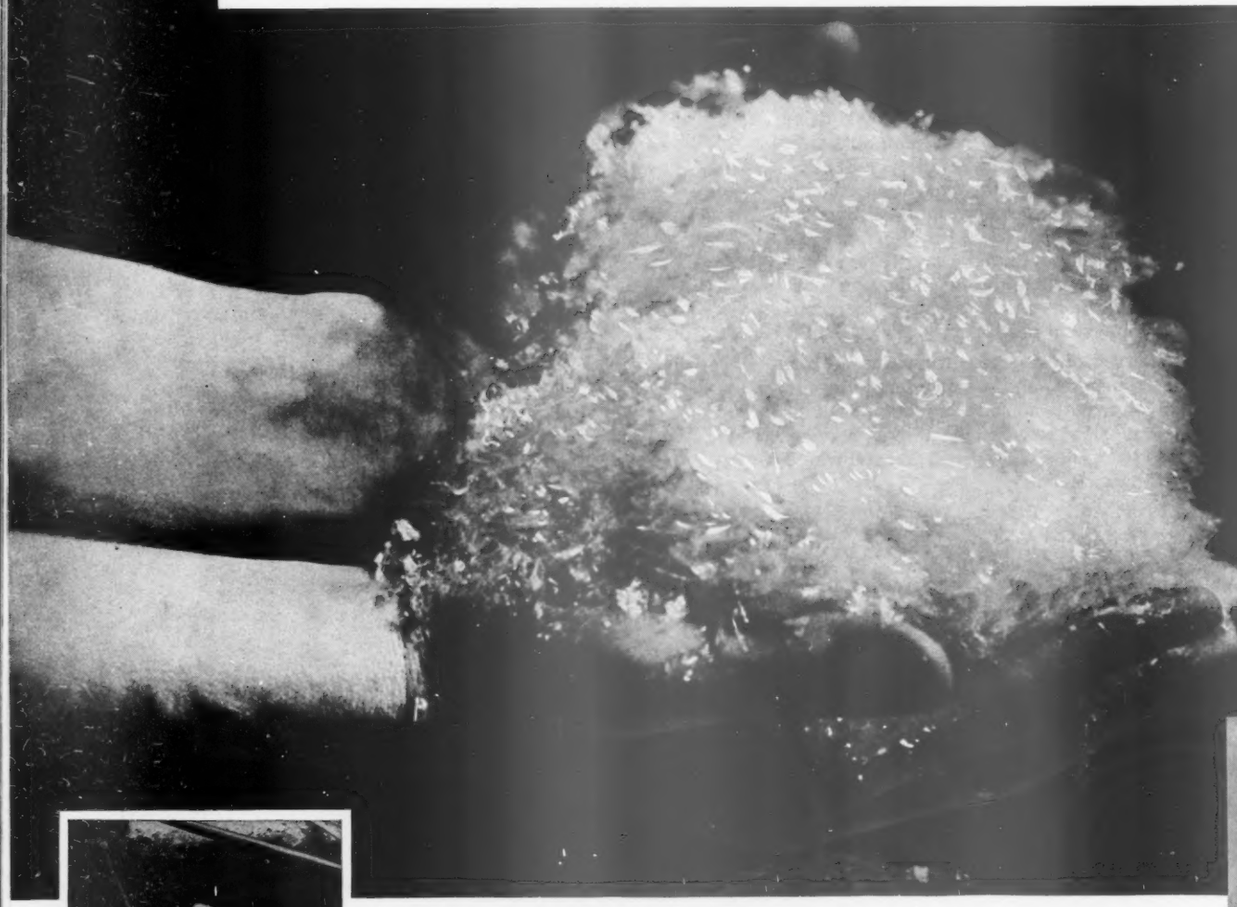
Prevents Mud Losses—Regains Circulation—Controls Cement Slurry Placement

Research scores again! JELFLAKE is a chemically inert flaky substance used exclusively by Dowell for regaining lost circulation in drilling wells. One of its important uses is with bentonite and cement for sealing off highly porous formations where the cement slurry is being lost. JELFLAKE is also useful in acidizing oil wells. Small amounts can be added to Jelly Seal to improve its temporary plugging properties in extremely porous formations.

JELFLAKE is a superior agent because it has enormous area per unit of weight, high tensile strength and is unaffected physically or chemically by water or mud; will not ball up, accumulate or bridge in the hole, and stays in suspension. JELFLAKE will pass readily through most types of pump valves. Nearly every formation in which mud or cement is lost can be readily sealed off with JELFLAKE.

DOWELL INCORPORATED

Executive Office: Midland, Michigan—General Office: KENNEDY BLDG., TULSA, OKLAHOMA—*Subsidiary of The Dow Chemical Company*



To regain circulation, Jelflake is spread near the suction of the slightly submerged mudhog intake, stirred in manually and pumped into the drill pipe.

The importance of this latest Dowell achievement is proved by its wide acceptance. Here is a typical example of results obtained with JELFLAKE.

An Illinois well had been losing circulation for two days. Thirty tons of cotton seed hulls and several pits of colloidal drilling mud were pumped down the hole. The situation was desperate.

Finally, 200 pounds of JELFLAKE were mixed with a small pit of mud and pumped into the drill pipe. The pumps were stopped periodically to insure a maximum filtration of flakes onto the porous rock.

Within one hour full returns were gained and drilling was resumed.

To keep up with the times, keep up with Dowell. Through collaboration with its parent company, The Dow Chemical Company, other developments of equal importance are destined to follow.

DOW SERVES THE NATION WITH CHEMICAL PRODUCTS

For Example: Dow Caustic Soda, supplied to industry in three forms—flake, liquid, solid—finds important use in Mercerizing Cotton, Cotton Bleaching, Rayon Manufacturing, Soap Manufacture, Oil Refining, Rubber Reclaiming, and in the Manufacture of Paper.

NOTICE: Visco Products Company is authorized to manufacture and sell Visco Oil Treating Compounds for use in the breaking and resolving of oil emulsions under the following United States patents:

1,860,562	1,912,330	2,050,639	2,214,783	2,206,589	Re. 20,717 &
1,860,563	1,937,259	2,050,640	2,214,784	2,225,189	patents pending.

Any purchaser of Visco oil treating compounds is authorized to use the same in the treating, breaking and resolving of oil emulsions in accordance with the above patents. Visco Products Company is authorized to and is willing to grant licenses to oil companies under any and all of the above patents on royalty bases, permitting the producer to purchase the oil treating compounds at will from any vendor, and to prepare the compounds for use under the above patent or patents. Application for license should be made to VISCO PRODUCTS COMPANY, Houston, Texas.

VISCO PRODUCTS COMPANY, *INCORPORATED* · **HOUSTON, TEXAS**

A year of promise

New business—millions of barrels—is promised in 1941—as the defense buying program swings into its stride, while domestic consumption keeps going up at the same time

Superoctane aviation fuel for fighting airplanes, butadiene for producing synthetic rubber, toluene for making vital supplies of TNT, will be needed in enormous volume Home fires must be kept burning and domestic wheels must be kept spinning, too

Brand new processes—Universal processes—are ready and waiting to turn out the new products efficiently, speedily and in any quantity needed Dubbscracking is always ready—and working

These processes include:

Dubbscracking
Pyrolitic reforming
Catalytic cracking
Catalytic reforming
Polymerization
Alkylation
Isomerization
Cyclization
Aromatization
Hydrogenation
Dehydrogenation

All of them are available to all American refiners through Universal And the help of Universal's staff of refinery specialists goes with them

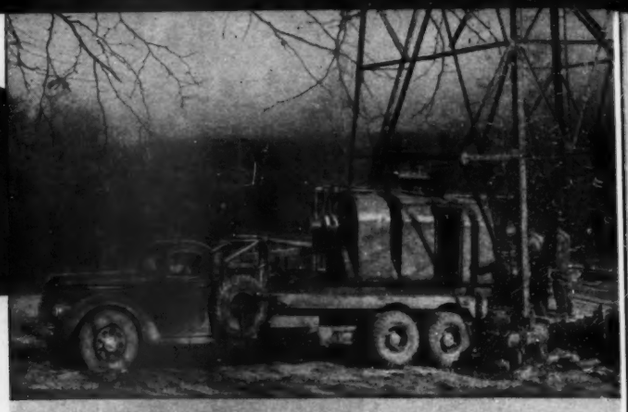
Truly 1941 is a year of promise

HAPPY NEW YEAR

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

PROVED



Heavy-duty International Trucks bear the brunt of the hard work in the oil fields of the world. In every division of the industry, Internationals are the popular choice.

PERFORMANCE *claims* and performance *facts* dovetail into *proved* acceptance when International Trucks, TracTracTors, and Power Units go to work in the oil fields. The ability to handle the toughest jobs at *low cost* puts International Harvester equipment on top.

What are your requirements? International Harvester builds power units ranging up to 110 max. h.p. for gasoline, Diesel, kerosene, and distillate operation. Here is a wide variety of sizes to choose from—and when additional power is needed, two or more can be installed and cut in and out as the load requires.

The four new International Diesel TracTracTors have proved themselves able to fit into many oil field operations. On job after job, they are getting the call because of their work output, their economy, their low maintenance, and their ability to stand up under the toughest operating conditions.

International Trucks are *all-truck*—through and through. Whether you need a small truck for hauling light equipment or a massive six-wheeler for moving boilers and derricks, the proved record of International merits your investigation.

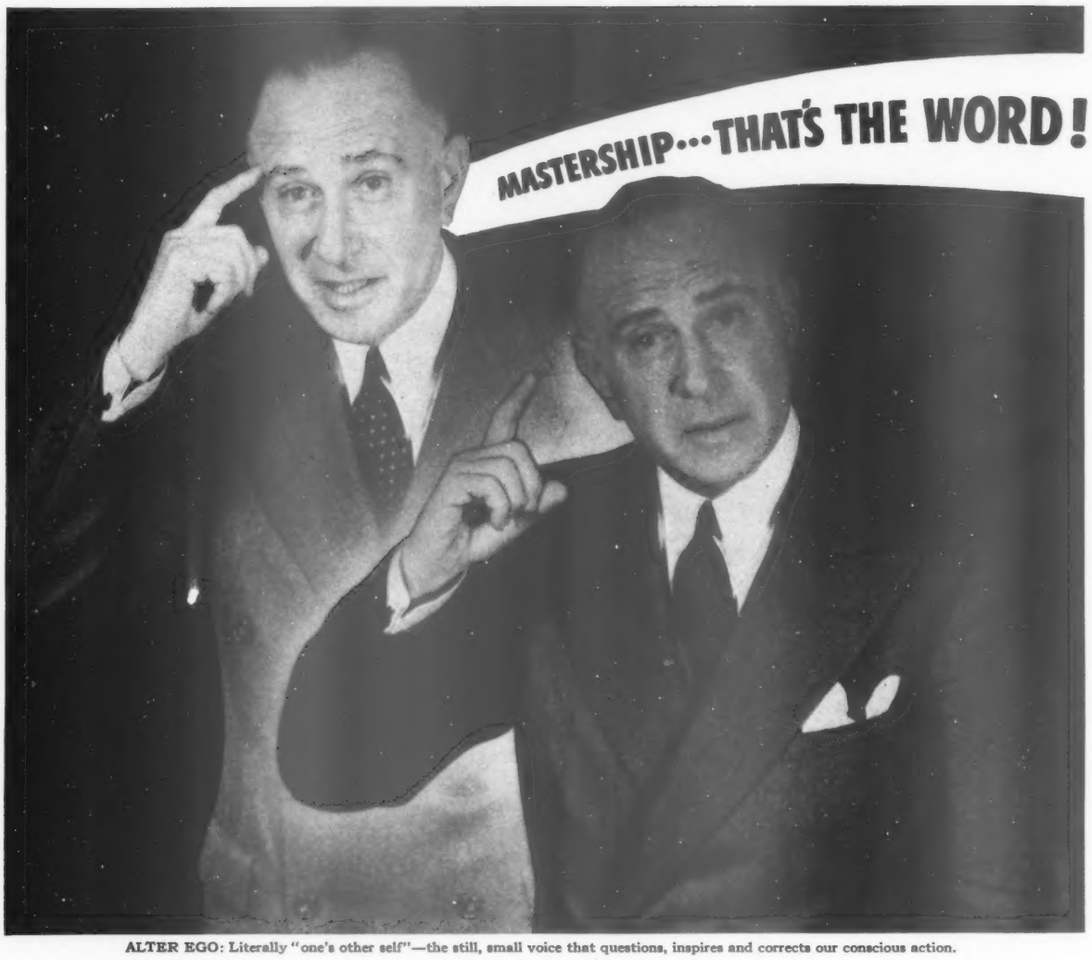
Follow the advice of oil men who are sticking with International because *they know it pays*. Let the nearby International Dealer or Company branch tell you about this great line of equipment.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

Pumping engines often have to be able to "take it" on 24-hour-a-day stretches. Above: The 4-cylinder International Model U-2 Power Unit working in the Claflin pool in Kansas.

Slush pits are dug fast and at low cost with International TracTracTors. This crawler and bulldozer is owned by the Signal Oil and Gas Co., Huntington Beach, Calif.

INTERNATIONAL HARVESTER



ALTER EGO: Literally "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

ALTER EGO: We have the *ability* to get faster welding and smoother, stronger welds. Stop imagining—even to yourself—that we haven't.

Well, the shop hasn't taken any prizes so far. At least our work isn't up to expectations.

ALTER EGO: Then the boys aren't getting that something which gives them *mastership* of their ability.

You've hit the words. Now to put them to music. Let's find that something.

ALTER EGO: Maybe they need a welder that will add *flexibility* to *ability*. Why not get Lincoln's suggestion.

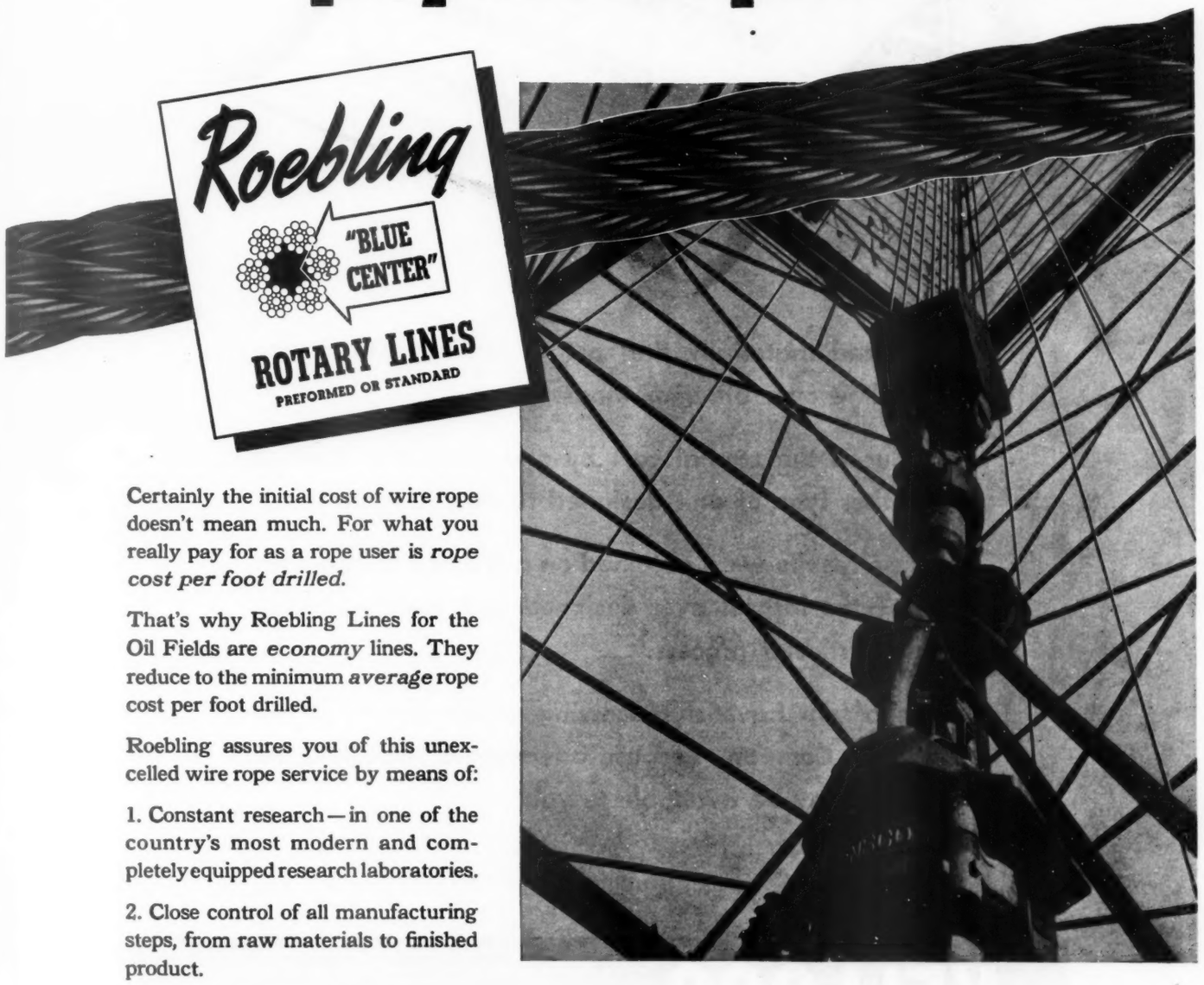
• •

LINCOLN SUGGESTS: A full kit of tools is essential for *mastership* of any skilled workman's ability. In arc welding, the full benefit of the welder's skill is assured by "Shield-Arc's" Dual Continuous Control which allows independent adjustment of both the *type* of arc and its *intensity* for faster welding and better welds. How? See Page 6, Bulletin 412.

LINCOLN "SHIELD-ARC" WELDING THE LINCOLN ELECTRIC COMPANY Cleveland, Ohio

Largest Manufacturers of Arc Welding Equipment in the World

How much do you pay for Rope?



Certainly the initial cost of wire rope doesn't mean much. For what you really pay for as a rope user is *rope cost per foot drilled.*

That's why Roebling Lines for the Oil Fields are *economy* lines. They reduce to the minimum *average* rope cost per foot drilled.

Roebling assures you of this unexcelled wire rope service by means of:

1. Constant research—in one of the country's most modern and completely equipped research laboratories.

2. Close control of all manufacturing steps, from raw materials to finished product.

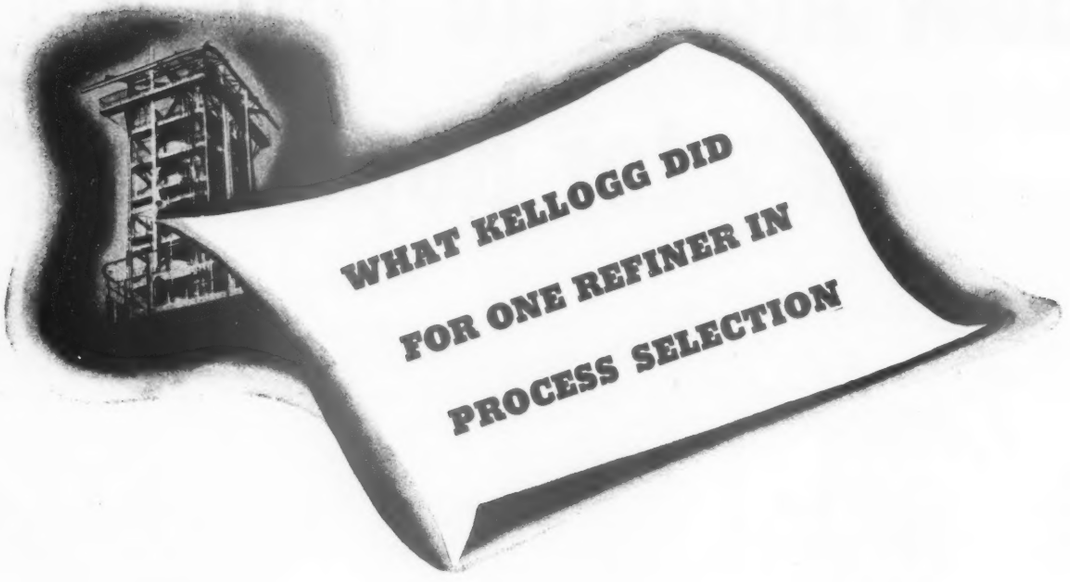
3. Nearly 100 years of wire fabricating experience.

JOHN A. ROEBLING'S SONS CO.
Trenton, N. J. Branches in Principal Cities

ROEBLING OIL FIELD LINES FOR EVERY PURPOSE

Roebling "Blue Center" Rotary Drilling and Casing Lines—Bailing and Coring Lines—Sucker Rod and Tubing Lines—Winch Lines—Spudding Lines—Sand Lines—Cable Tool Drilling Lines—Guy Strand—Dead Lines—Wire Rope Fittings

Distributed by—THE NATIONAL SUPPLY COMPANY



Reduced materially the cost of making 100 octane gasoline over other methods.

Reduced the capital cost by one third over that of another type of unit designed to do the same thing.

These results were obtained on a recent Kellogg-built unit—the largest ever designed and constructed for this particular process.

When you have a processing problem consult the Kellogg Company because advantages similar to the above may be available to you.

KELLOGG

LICENSING AND CONSTRUCTION AGENTS under United States and foreign patents for:
Catalytic Processes for Cracking, Reforming, Dehydrogenation, Alkylation, Desulphurization

- Gasoline Products Company, Inc., Pyrolytic Cracking
- The Polymerization Process Corporation, Thermal and Catalytic Polymerization
- JUIK Processes for Lubricating Oil Refining with Propane and Phenol Deasphalting · Dewaxing · Solvent Extraction and Acid Treating Plants
- The Gray Processes Corporation, Clay Treating

THE M. W. KELLOGG COMPANY • JERSEY CITY, NEW JERSEY • 225 BROADWAY, NEW YORK
Los Angeles: 609 South Grand **Tulsa: Philtower Building**
EUROPEAN REPRESENTATIVE: Compagnie Technique des Petroles, 134 Boulevard Haussmann, Paris, France.

INTERNATIONAL PETROLEUM COMPANY

LIMITED

EXECUTIVE OFFICES

TORONTO, CANADA

Producers, Refiners, Distributors, and Marketers of Petroleum and Petroleum Products in the Republic of Peru

Distribution and Marketing Facilities at all Important Points on the West Coast of South America

Back of every Leschen Wire Rope is this plant, and back of the plant are 83 years of manufacturing experience . . . 83 years of staying "up-to-date."

The LESCHEN PLANT

Its Efficiency Works for Your Economy

Leschen Wire Rope is made in a large and up-to-date plant where modern equipment . . . proved principles . . . and experienced workmen are of equally major importance.

This is another link in the "Law of Leschen Quality" . . . another reason why "HERCULES" (Red-Strand) Wire Rope will perform more efficiently and economically for you. The added quality that we build into it is paid for by the savings that are made through advanced manufacturing methods and facilities.

You can discover for yourself the low operating cost of "HERCULES" (Red-Strand) Wire Rope by specifying it on your next purchase order.

"HERCULES" Rotary Lines are available in both Round Strand and Flattened Strand construction—either Standard or Preformed.

Domestic Distributors

AMERICAN SUPPLY COMPANY
Kilgore, Texas

THE CAMERON TOOL & SUPPLY CO.
Cameron, W. Va.

CASEY & NEWTON
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GUSTIN-BACON MANUFACTURING CO.
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Fort Worth, Houston, Tulsa

F. HAMILTON CO.
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HERCULES SUPPLY COMPANY
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HILLMAN-KELLEY, INC.
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KIMBELL-BOSTIC SUPPLY CO., INC.
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NADEAU BROTHERS COMPANY
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NORTH TEXAS HARDWARE CO., INC.
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PARKERSBURG SUPPLY COMPANY
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UNION PIPE AND SUPPLY CO., INC.
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UNITED PIPE AND SUPPLY CORP.
Charleston, W. Va.

UNITED SUPPLY & MFG. CO.
Tulsa, Oklahoma City, Stonewall, Chase, Kans., Hutchinson, Kans., Eunice, N. M., Denver City, Tex., Edna, Tex., Houston, Tex., Levelland, Tex., Odessa, Tex., Pampa, Tex.

WELL MACHINERY & SUPPLY CO., INC.
Fort Worth, Texas

WESTERN MACHINERY COMPANY
Salem, Ill.

Export Distributor

CONTINENTAL EMSCO COMPANY, INC.
30 Rockefeller Plaza, New York, N. Y.
Branches: Buenos Aires, London, Ploesti

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK . . . 90 West Street
CHICAGO . . . 810 W. Washington Blvd.
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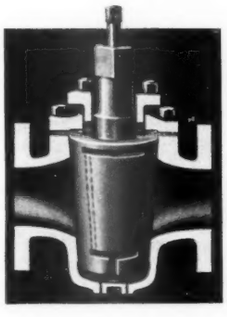
SAN FRANCISCO . . . 520 Fourth Street
PORTLAND . . . 914 N. W. 14th Avenue
SEATTLE . . . 3410 First Avenue South

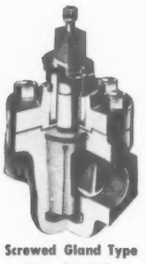
...it can't be done! Stand an egg on end? *Preposterous!* But Columbus was unperturbed. He deftly brought the egg down on the table, cracking it slightly at the bottom. The skeptics were amazed, for *there it stood.* ¶ Instinctively, it seems, Nordstrom Valve engineers have the knack of doing the *impossible.* Miracle valve accomplishments have been attained again and again as a result of Nordstrom ingenuity and initiative. *For instance:* Nordstrom pioneered the first successful lubricated plug valve. Nordstrom has built the largest plug valves, (30″). Nordstrom has developed the only types of valves with lubricants capable of operating at temperatures of 950° F. Nordstrom brought forth Hypreseal, the only plug valve that can take test pressures up to 15,000 lbs. per square inch. Nordstrom introduced new brittle-resistant alloys for temperatures of -150°. And again Nordstrom has cast precedent aside by *Merchroming* valve plugs and bodies with a continuous hard-facing for use in high temperature service and for corrosive and erosive conditions. The "toughest jobs" eventually come to Nordstrom; proof enough these valves meet *all* your needs.



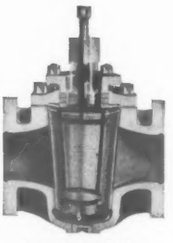
When it can't be done **NORDSTROM** *does it!*

KEEP UPKEEP DOWN

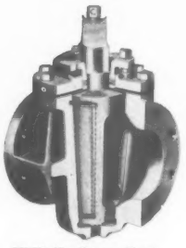
with these ALL-PURPOSE VALVES



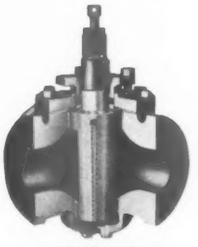
Screwed Gland Type
4" and Smaller



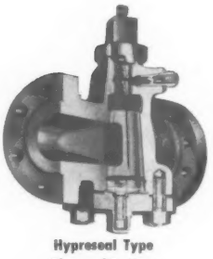
Bolted Gland Type
4" and Larger



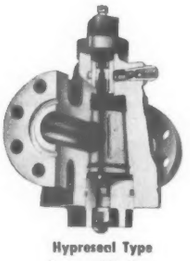
EMCO-Nordstrom Type
4" and Larger



Multiport Type
3 and 4-Way



Hypreseal Type
Flanged Bottom
Rectangular Opening



Hypreseal Type
Screwed Bottom
Round Opening

Descriptive Bulletin upon request.

DYNAMIC PERFECTION IN NORDSTROMS

All valves embody a dynamic principle. But dynamic *perfection* is a rare achievement. Its accomplishment in Nordstrom Valves marks one of the milestones in engineering progress. Comprised essentially of a plug and a body, Nordstroms utilize the simplest dynamic principle—that of turning a movable member within a sealed chamber. Nordstroms present the perfect application of the principle. With "Sealdport" lubrication and numerous other engineering advancements, Nordstrom Valves offer a cut-off control which is positive and as complete as though the line was sealed with a welded blank or blind. Incidentally, the practice of using blanks or blinds in connection with valves is totally unnecessary where Nordstroms are installed. The diversified use of Nordstroms on gas, oil, mud and chemical lines with working pressures, in some instances, running to 7500 lbs. and temperatures up to 950° F., is indicative of their perfection.

Nordstrom LUBRICATED VALVES

Sealdport Lubrication

MERCO NORDSTROM VALVE COMPANY—*a Subsidiary of* Pittsburgh Equitable Meter Company

WORLD'S LARGEST MANUFACTURERS OF LUBRICATED PLUG VALVES; GASOLINE, OIL & GREASE METERS

Main Offices: 400 Lexington Ave., Pittsburgh, Penna.

BRANCHES: New York City, Buffalo, Philadelphia, Columbia, Memphis, Chicago, Kansas City, Des Moines, Tulsa, Houston, Los Angeles, Oakland.

CANADIAN Licensees: Peacock Bros., Ltd., Montreal. • *EUROPEAN Licensees:* Audley Engineering Co., Ltd., Newport, Shropshire, England

PRODUCTS: Nordstrom Lubricated Valves; Air, Curb and Meter Cocks • Nordstrom Valve Lubricants • EMCO Gas Meters • EMCO-McGaughy Integrators EMCO Regulators • Pittsburgh Meters for Gasoline, Grease, Oil, Water and other Liquids • Raybould Couplings • Stupakoff Bottom Hole Gauges

Coming
Cast Their S
Before Them . . . . .

G.S.I. LEADS 2 to 1 IN PRODUCING FIELDS

REFLECTION SEISMOGRAPH SURVEYS by G. S. I. have proved their scientific accuracy in 141 producing fields throughout the world. Favorable structural conditions have been located and mapped. G. S. I. working in close co-operation with the clients' geologists has justified the drilling of many test wells that have led to important discoveries. The reliable interpretation of data saves the cost of many dry holes.

G. S. I. with its special equipment, experience and modern technique can meet any requirement—your assurance that G. S. I. can help you reduce the cost of finding oil.

GEOPHYSICAL SERVICE INC.

EUGENE McDERMOTT, President

SEISMOGRAPH SURVEYS
GEOCHEMICAL SURVEYS

Branch Offices: Houston, Texas - Jackson, Miss.
Los Angeles, Calif. • Tulsa, Okla.

DALLAS, TEXAS

B & W CROLOY 2¼

Cuts Costs

Nominal Percentage Analysis	
Carbon	0.15 Max.
Manganese	0.30–0.60
Sulphur	0.030 Max.
Phosphorus	0.030 Max.
Silicon	0.50 Max.
Chromium	2.00–2.50
Molybdenum	0.90–1.10

Higher creep strength.

Thinner walls can be used.

Increased oxidation resistance.

Increased corrosion resistance.

Useful in 75 per cent of refineries.

Best overall economy alloy for suited uses.

T-1127

BABCOCK & WILCOX TUBES

HOT FINISHED COLD DRAWN ALLOY STEELS CARBON STEELS

THE BABCOCK & WILCOX TUBE COMPANY, BEAVER FALLS, PA.

Not a CENT For REPAIR in 75,000 Feet of Drilling!

This is the first BAASH-ROSS Type 2RS Roller Kelly Drive Bushing, placed in service nearly two years ago. When it had drilled 40,000 feet it was disassembled and carefully inspected. All of the original parts were in excellent condition, so they were put back in place and the Bushing was moved to a new well.

Now it has drilled more than 75,000 feet of hole and all of the ORIGINAL PARTS are still in good condition, still good for thousands of feet of drilling. The only maintenance has been regular greasing with the grease gun that is used for the other rig equipment; *not a cent has been spent for repair.* Based on its original price, this Drive Bushing has served the operator for a fraction of cent per foot of hole drilled to date. Every day this fraction of a cent is decreasing—but the *quality of service* is as good as the day the Drive Bushing was new.

BAASH-ROSS Type 2RS ROLLER KELLY DRIVE BUSHING

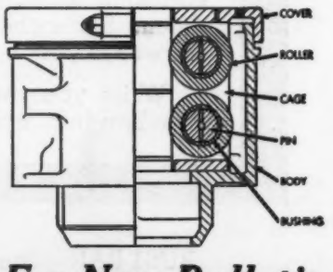
have been used in drilling hundreds of deep wells under modern high-speed, heavy torque-load conditions. Long, economical service is built into them originally, and they are so designed that when reconditioning does become necessary the cost will be very small.

Change to Baash-Ross Roller Kelly Drive Bushings—you'll find that they more than "pay their way."

Engineered and Constructed For Modern High-Speed Drilling!

Here are the highlights on the BAASH-ROSS Type 2RS Roller Kelly Drive Bushing:

● Extra large diameter rollers (two in each cage) distribute the torque to the kelly, protecting its driving surfaces through reduced unit pressure. The rollers are made very hard to resist wear on their O.D. • High-hardness *replaceable* roller bushings eliminate wear on the *I.D.* of the rollers • Oversize *reversible* hardened-and-ground roller pins give *double service life* and eliminate pin breakage • Adequate lubrication insured by individual grease ducts to the moving surfaces of each roller assembly.



Described in Your Composite Catalog—Send For New Bulletin

BAASH ROSS

TOOL COMPANY — LOS ANGELES

OIL WELL TOOLS · SPECIALTIES — HOUSTON · NEW YORK

FIGHT
THE RUST MENACE!
WITH RUST-BAN*
THE BEST LINE OF DEFENSE
On sea and land, in the air and underground, Rust-Ban protects metallic surfaces from corrosion. Rust-Ban is not a single product but a complete line of rust preventives for combating corrosion under practically every service condition. Somewhere in the Rust-Ban line is the answer to your corrosion problem.
Write your nearest marketer for complete Rust-Ban information.
* REG. U. S. PAT. OFF.

RUST-BAN—The most complete line of rust preventives on the market—is sold:

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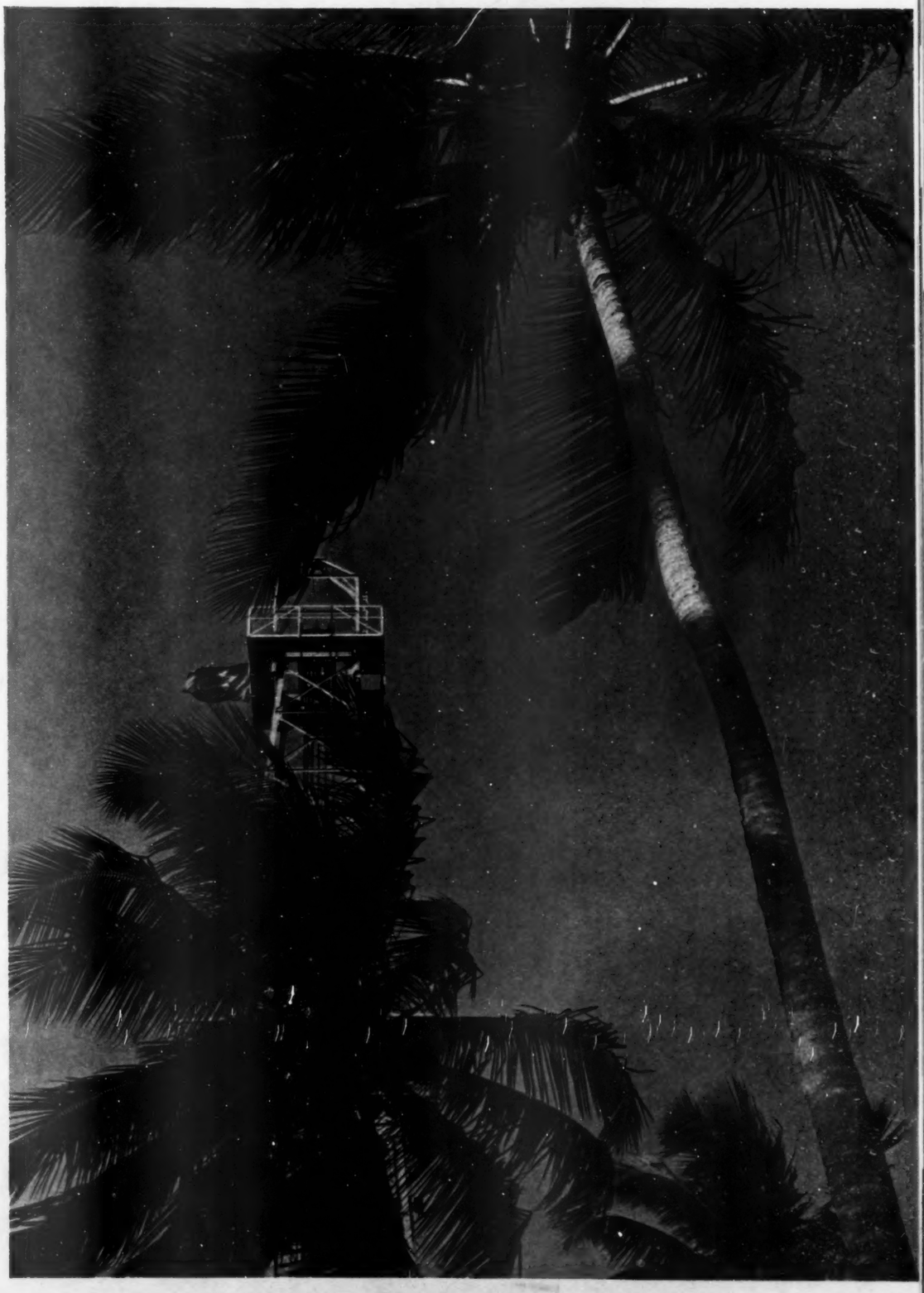

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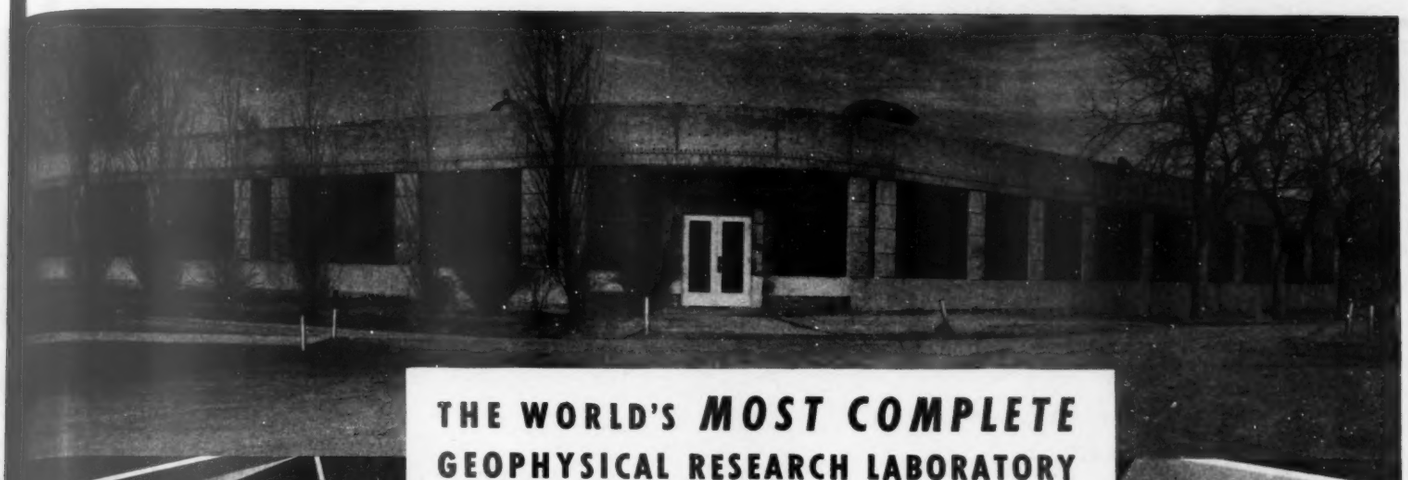

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LA WESTERN GEOPHYSICAL COMPANY, gracias a años de experiencia, estudios e investigaciones prácticas y de laboratorio, está completamente preparada para satisfacer las necesidades de aquellas empresas que exigen los más exactos estudios geofísicos con sismógrafos de reflexión. Tenemos listas para trabajar en cualquiera parte del mundo, cuadrillas de gran competencia y experiencia profesional. Invitamos su correspondencia.

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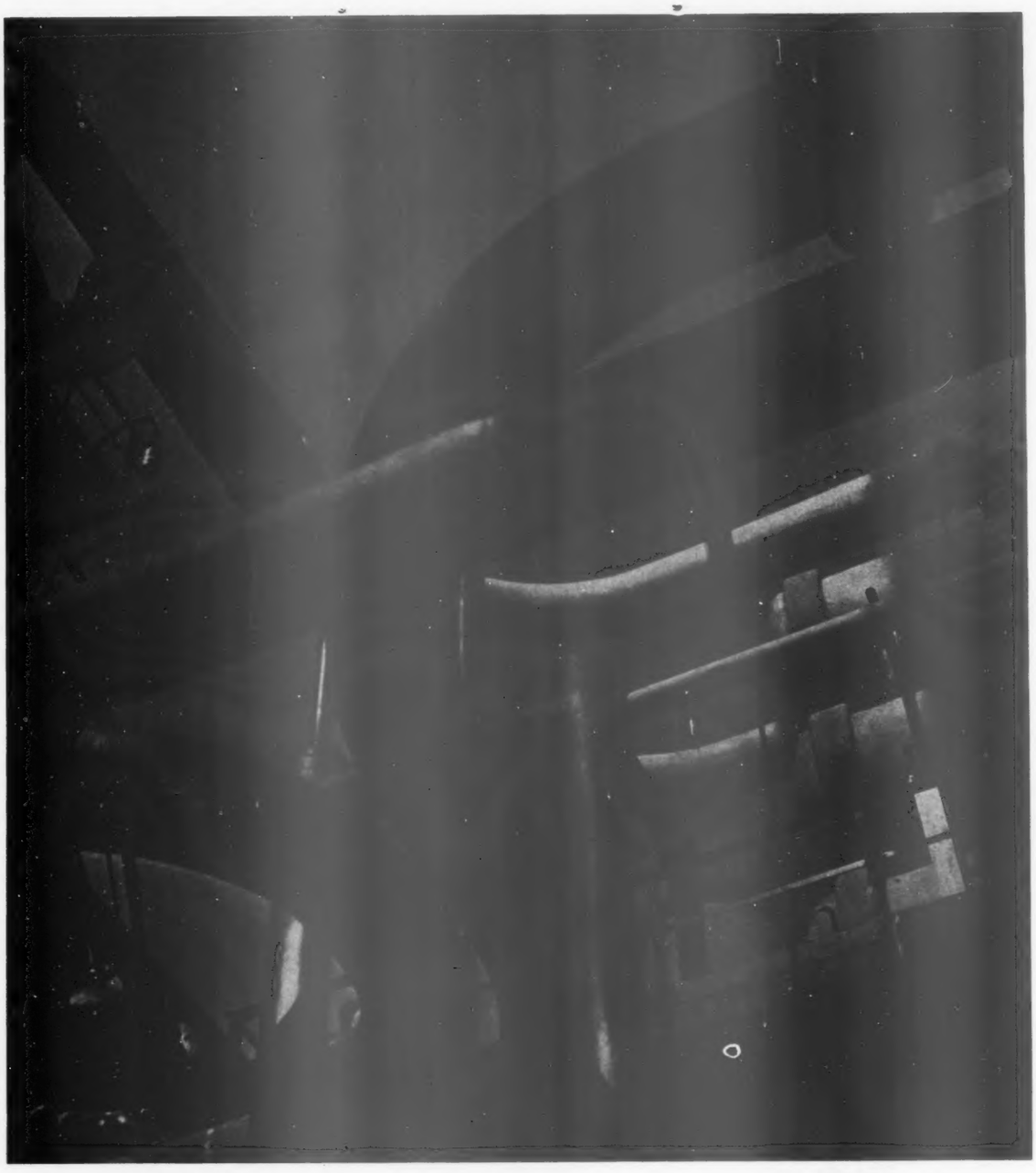

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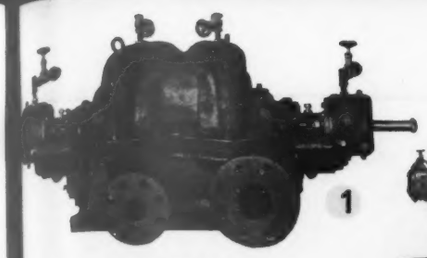

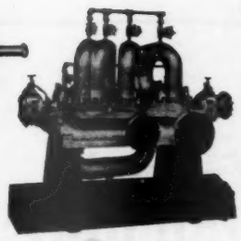

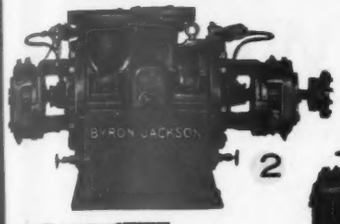

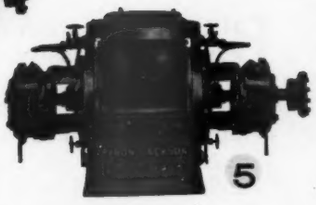

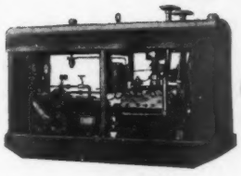

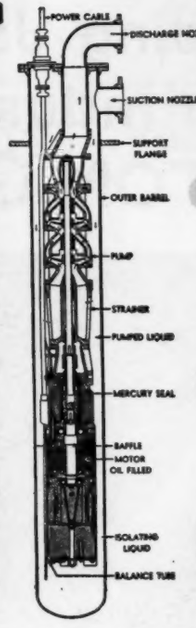

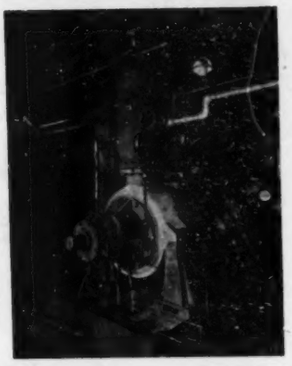

¿Por qué no compra BUENOS RESULTADOS en equipo de bomba, dejando que la Byron Jackson a cargo de los detalles?

Why not buy PUMPING RESULTS — and let Byron Jackson take care of the Details?

1. Las bombas Byron Jackson Multiplex son ideales para el servicio de petróleo frío o caliente donde las capacidades llegan a 75.000 barriles al día, con presiones hasta de 1.200 libras por pulgada cuadrada

2. Para alta capacidad, contra columnas hidráulicas bajas o medianas, las bombas de refinería Byron Jackson VC (de aspiración simple de dos etapas) manejan de 40 a 6.000 galones por minuto a temperaturas que llegan hasta 850 grados F. y columnas hidráulicas que alcanzan hasta 900 piés.

3. Introducidas por la Byron Jackson Co. en 1901, y desde entonces, constantemente perfeccionadas, las turbobombas Byron Jackson Deepwell suministran grandes rendimientos, funcionamiento exento de irregularidades y servicio de bajo costo, en la extracción de agua de pozos perforados, lagos, ríos y otras fuentes de abastecimiento. Se ofrecen en varios modelos y en varios tipos de propulsión, para bombar de 25 a 10.000 galones por minuto, con columnas hidráulicas de 50 a 800 piés. El grupo aquí ilustrado fué recientemente instalado en la famosa planta de estabilización, recuperación de gasolina y mantenimiento de presión de Ville Platte, de la Continental Oil Company.

4. La bomba Byron Jackson OL Multiplex se adapta a bombar petróleo donde las capacidades se comprenden en una escala de 250 a 2.000 galones por minuto, con columnas hidráulicas de 600 a 2.800 piés.

5. Donde el servicio es mecánico o hidráulicamente severo, se recomiendan las bombas de petróleo caliente Byron Jackson de DOBLE ASPIRACION o succión. Escala de capacidad de 600 a 3.000 galones por minuto; escala de columna hidráulica de 200 a 800 piés.

6. Las bombas Byron Jackson PUP son modelos centrífugos, que satisfacen todos los requisitos de un equipo portátil práctico. Se caracterizan por gran adaptación, firmeza, economía en costo inicial y gastos de funcionamiento, peso liviano y gran rendimiento. La bomba PUP funciona con gas natural, gasolina o destilado, y se suministra únicamente como grupo de bombar (ilustrado), con montaje en remolque de dos a de cuatro ruedas. Aplicaciones: Toda clase de servicio provisional o de trabajo semi permanente. Escala de capacidad: de 100 a 600 galones por minuto. Escala de columna hidráulica: de 100 a 1.000 piés.

7. La Byron Jackson SUMERGIBLE es un grupo de bombar, que comprende un motor eléctrico montado debajo de una turbobomba de pozo profundo, a la cual está acoplado directamente. Tanto el motor como la bomba funcionan completamente sumergidos en el agua. La corriente eléctrica se envía de la superficie al motor sumergido, mediante un cable de tipo submarino. La SUMERGIBLE no tiene igual en seguridad, rendimiento y economía en conexión con la extracción de agua de pozos perforados. El largo árbol, común a las bombas ordinarias de este tipo, se has suprimido en el presente caso, y con esto se evita el desperdicio de fuerza y las prematuras reparaciones y repuestos, debido a la rotación de un largo árbol en muchos cojinetes.

La SUMERGIBLE se ofrece para instalación en pozos de diámetro interior mínimo de 6 a 16 pulgadas. Suministra de 50 a 5.000 galones por minuto, y desarrolla de 5 a 350 caballos de fuerza.

8. La HYDOPRESS se recomienda para servicio de refinería de petróleo frío o caliente, de baja capacidad y de alta columna hidráulica, para trabajo de represión y similares requisitos, en que las capacidades son de 10 a 200 galones por minuto contra columnas hidráulicas que llegan hasta 7.000 piés.

9. Aceptadas como las mejores de su clase, las bombas Byron Jackson DOUBLE CASE para la carga de petróleo caliente, se ofrecen en un tipo de presión mediana, para máxima columna hidráulica de 2.000 piés, y en un tipo de alta presión, para máxima columna hidráulica de 10.000 piés, para el manejo de 150 a 2.000 galones por minuto.

10. Esta es una nueva bomba, sin empaquetadura ni prensaestopas, para propano, butano y otros líquidos muy volátiles. Solicite el boletín relativo a la bomba Byron Jackson STUFFINGBOXLESS.

11. Las bombas Byron Jackson BILTON se usan mucho para el servicio de bombar líquido frío o caliente. La bomba está unida a un motor de inducción, formando un grupo relativamente pequeño, que se adapta al funcionamiento en posición horizontal, inclinada o vertical. El árbol es común para la bomba y el motor, ahorrándose así espacio y la necesidad de emplear un acoplamiento flexible. Escala de capacidad: modelo de una etapa, de 10 a 1.500 galones por minuto; modelo de dos etapas, de 40 a 300 galones por minuto. Escala de columna hidráulica: modelo de una etapa, de 10 a 300 piés; modelo de dos etapas, hasta 500 piés.

12. La bomba Byron Jackson BM PROCESS, con un solo prensaestopa, ofrece ventajas en aquellos casos en que es difícil retener el líquido en la caja del prensaestopa. Capacidades, de 10 a 7.000 galones por minuto; columnas hidráulicas de 20 a 500 piés.

1. Byron Jackson Multiplex Pumps are ideal for cold or warm oil service where capacities range to 75,000 barrels per day; pressures to 1,200 lbs. per square inch.

2. For high capacity against low or medium heads, Byron Jackson VC Refinery Pumps (of two stage single-suction design) handle from 40 to 6,000 g.p.m. at temperatures to 850° F., and heads to 900 feet.

3. Pioneered by Byron Jackson Co., in 1901, and constantly improved, Byron Jackson Deepwell Turbine Pumps provide high efficiencies, trouble-free operation and low-cost service in pumping water from bored wells, lakes, rivers or other sources of supply. Various designs, for several types of drives, are available for pumping from 25 to 10,000 g.p.m. at heads from 50 to 800 feet. The unit pictured recently was installed at Continental Oil Company's record-breaking Ville Platte Stabilization, Gasoline Recovery and Pressure Maintenance Plant.

4. The Byron Jackson OL Multiplex is suited to general high head oil pumping where capacities range from 250-2,000 g.p.m., and heads from 600-2,800 feet.

5. Where service is mechanically or hydraulically severe, Byron Jackson DOUBLE SUCTION Hot Oil Pumps are recommended. Capacity range 600-3,000 g.p.m.; head range 200-800 feet.

6. Byron Jackson PUP Pumps are centrifugal Pick-Up Pumps which meet all the requirements for portable pumping units which combine Flexibility, Sturdiness, Low Initial and Low Operating Costs, Light Weight, and High Efficiency. The PUP operates on natural gas, gasoline or distillate, and is furnished as a pumping unit only (illustrated); with 2-wheel trailer or 4-wheel trailer mounting. Applications: All classes of pick-up service or for semi-permanent installations. Capacity Range: 100 to 600 g.p.m. Head Range: 100 to 1,000 feet.

7. The Byron Jackson SUBMERSIBLE is a close-coupled pumping unit made up of an electric motor mounted below a deepwell turbine pump to which it is direct-connected. Both motor and pump operate completely submerged in water. Electric power is delivered from the surface switchbox to the submerged motor through a submarine type cable. The SUBMERSIBLE is unequalled for the safe, dependable and economical pumping of water from bored wells. The conventional long shaft has been eliminated, thus avoiding wasted power and premature repairs and replacements due to rotation of the shaft in many bearings.

The SUBMERSIBLE is made for installation in wells having a minimum inside diameter from 6 to 16 inches; delivering from 50 to 5,000 g.p.m.; horsepower 5 to 350.

8. The HYDROPRESS is designed for low capacity, high head hot or cold refinery service, repressuring and similar requirements where capacities range from 10-200 g.p.m. against heads to 7,000 feet.

9. Acknowledged the Leader, Byron Jackson DOUBLE CASE Hot Oil Charging Pumps are made in a Medium Pressure Type for heads to 2,000 feet, and a High Pressure Type for heads to 10,000 feet, handling from 150-2,000 g.p.m.

10. Here's a new pump with No Packing and No Stuffing Boxes for propane, butane and all highly volatile liquids. Ask for Bulletin on the Byron Jackson STUFFINGBOXLESS Pump.

11. Byron Jackson BILTON Pumps are widely used for general cold or warm pumping service. The pump is close-coupled to an induction motor, making a compact integral unit which is adapted for operation in a horizontal, inclined or vertical position. The shaft is common to the pump and motor, thus saving both space and the use of a flexible coupling. Capacity Range: single stage, 10-1,500 g.p.m., two-stage, 40 to 300 g.p.m. Head Range: single stage, 10-300 feet, two-stage, up to 500 feet.

12. Where the material being pumped is difficult to hold in a stuffing box, the Byron Jackson BM PROCESS Pump—with its single stuffing box has a decided advantage. Capacities, 10 to 7,000 g.p.m.; heads from 20 to 500 feet.

BYRON JACKSON CO., Export Office: 420 Lexington Ave., New York, N. Y., U. S. A. General Offices: LOS ANGELES, CALIF.; SALES OFFICES, Houston, Chicago

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En más de 150 ciudades en los Estados Unidos de América, América Central y América del Sur, lo mismo que en otras naciones del mundo, hay distribuidores con abundantes existencias de ruedas amoladoras Norton para inmediatas entregas. Pídanos el nombre del más cercano a su localidad.

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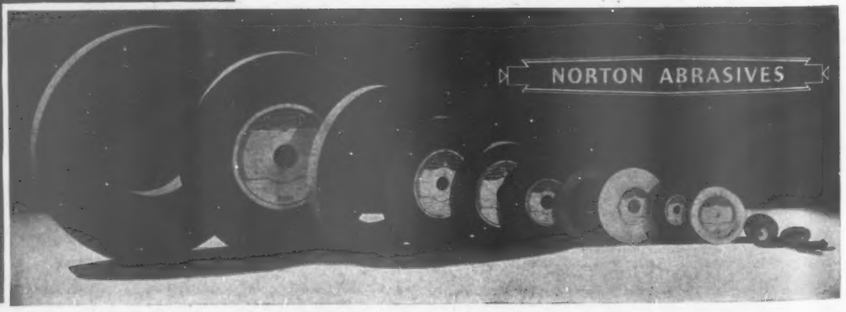
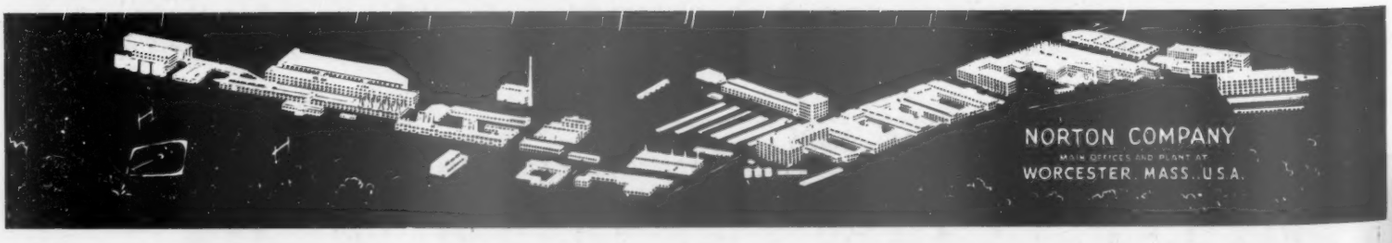
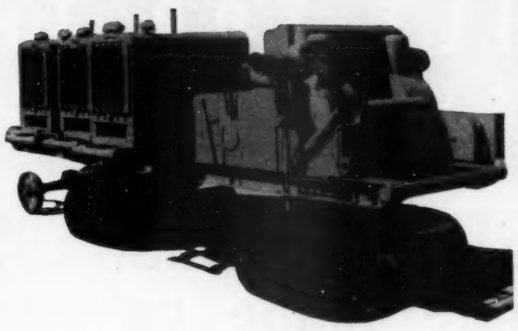




● Wilson Giant Model Double Drum Standby Hoist — Extensively used in California and elsewhere. Dead end of main drilling line is attached to lower drum and upper drum used for wire line core barrel or bailing service. Rotary drive standard equipment.

● Montacarga Wilson, modelo Giant, de doble tambor—Se usa mucho en California y otros lugares. El cabo fijo del cable principal de perfoación se une al tambor inferior, mientras el tambor superior se usa para el cable de alambre del sacanúcleos o achicador. Equipo normal de propulsion de rotativa.



● Wilson Giant Model Drilling Rig with Chain Transmission capable of transmitting power of two 250 horsepower engines. This unit is recommended for drilling wells up to six thousand feet with 4" drill pipe and can be used to drill slim hole to 8,000 feet with 3½" drill pipe. This rig retains the portability of lighter units and still compares in drilling cost per foot with the heaviest drilling equipment. For drilling from 3,000 to 6,000 feet, this is the most popular rig ever built.

● Aparejo de perforación Wilson, modelo Giant, con transmisión por cadena, capaz de transmitir la fuerza de dos motores de 250 cdf. Este grupo se recomienda para la perforación de pozos de hasta seis mil piés de profundidad con tubo de perforación de 4", y puede usarse para perforar agujeros angostos hasta de 8000 pies, con tubo de perforación de 3½". Esta aparejo retiene la facilidad de transporte de los grupos más livianos y se compara favorablemente en costo de perforación por pié, con los equipos de perforación más pesados. Para la perforación de 3000 a 6000 piés, este es el aparejo más popular de todos.

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RIGS WINCHES
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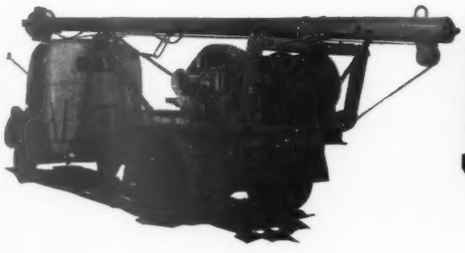

● Wilson Master Model Speed Winch on Cab-over-engine Ford Truck, with 7-8-50 ft. Single Mast pole. Wilson Split-Shaft Power-take-off and bevel gear transmits truck engine power to drum through Wilson Internal Expanding Friction Clutch in drum. With space for tool house between cab and winch, this is an ideal portable well servicing unit.

● Montacargas Wilson, modelo Master, instalado en camión Ford de tipo de garita sobre motor, con mástil, de 7-8-50 piés. El tomafuerza Wilson de árbol gendido y el engranaje cónico transmiten la fuerza del motor del camión al tambor mediante un embrague de fricción de extensión interior en el tambor. Con espacio para llevar herramientas entre la garita y el montacargas, este modelo es idea, como equipo portátil.

● Wilson Single Engine Giant Model Draw Works completely equipped for rotary drilling to depths of 4,000 feet using 4½" drill pipe. This light weight, unitized draw works has been found most practical where a single engine drilling rig is preferred. Can be furnished with gear transmission, chain transmission or with torque converter.

● Tornos de extracción Wilson, modelo Giant de un solo motor, completamente quipado para perforación por sistema rotativo, a profundiades de 4000 piés, usando tubo de perforación de 4½". Este torno de extracción unitario, de peso liviano, resulta muy práctico en aquellos puntos donde se prefiere un equipo de su clase accinado por un solo motor. Puede suministrarse con transmisión por engranajes, por cadena y con un convertidor de esfuerzo de rotación.

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Type G-SC two-cylinder pumping engine, owned by General American Oil Co., Ferguson Lease, East Texas. Rated 25 to 35 hp, at 600 to 800 rpm.

Tipo G-SC de máquina de bombar de dos cilindros, propiedad de la General American Oil Company, Concesión Ferguson, East Texas. Capacidad de 25 a 35 cdf. a una velocidad de 600 a 800 rpm.

Type G-AW two-cylinder gas engine, owned by Carter Oil Company, Beecher City, Ill. Rated 100 to 150 hp, at 225 to 325 rpm.

Tipo G-AW de motor de gas de dos cilindros. propiedad de la Carter Oil Company, Beecher City, Illinois. Capacidad de 100 a 150 cdf. a una velocidad de 225 a 325 rpm.

Eight Type G-MR four-cylinder compressor units owned by F. W. Burford, Capps gasoline plant, Miller County, Arkansas. Each rated 300 hp at 300 rpm.

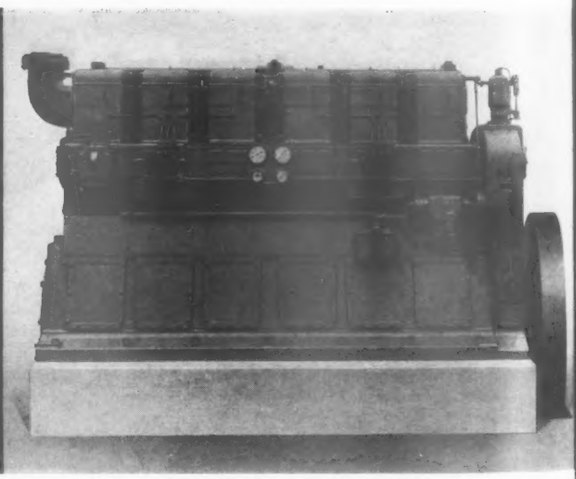
Ocho grupos de compresores de cuatro cilindros, de tipo G-MR, propiedad de F. W. Burford, refinera de gasolina Capps, condado Miller, Arkansas. Cada grupo tiene capacidad de 300 cdf. a una velocidad de 300 rpm.

There's a complete range of Cooper-Bessemer gas and Diesel engines and compressors for oil field service . . . 25 to 1650 hp and many of them convertible from gas to Diesel, or Diesel to gas. Every unit is field-proven . . . backed by 106 years of engine-building experience, built to withstand severe service, and economical to operate.

Hay un completo surtido de motores de gas, motores diésel de petróleo y compresores, de marca Cooper-Bessemer, para servicio en campo petrolífero . . . en capacidades de 25 a 1650 cdf. Muchos de ellos son motores de gas convertibles en motores diésel, o motores diésel convertibles en motores de gas. Cada modelo ha demostrado su adaptabilidad, mediante servicio práctico en campos petrolíferos . . . y lleva la experiencia de 106 años dedicados a la fabricación de motores. Todos están construidos para el servicio más exigente y funcionar con máxima seguridad y economía.

Three Type G-MV gas-engine-driven compressor units, at Tropical Oil Company's station, Barranquilla, Colombia, S. A., each rated 400-hp at 300-rpm.

Tres compresores de tipo G-MV accionados por motor de gas, instalados en la estación de la Tropical Oil Company, en Barranquilla, Colombia. Cada compresor desarrolla 400 caballos de fuerza a 300 revoluciones por minuto.



Type J S, 6-cylinder, Diesel Engine, for general oil field power and pipeline pumping service. Built in 5, 6, 7 and 8-cylinder units, rated 325 to 925-hp at 325 to 514-rpm.

Motor Diésel, de 6 cilindros, de tipo JS, para servicio general en campo petrolífero y para trabajo de bomba de línea de tubería. Se ofrecen en modelos de 5, 6, 7 y 8 cilindros, de 325 a 925 caballos de fuerza a 325 a 514 revoluciones por minuto.

Pídanos información detallada sobre nuestros motores Cooper-Bessemer de gas y diésel de petróleo, de 15 a 1650 cdf.

WRITE FOR INFORMATION ON COOPER-BESSEMER GAS AND DIESEL ENGINES, 15 to 1650

THE COOPER-BESSEMER CORPORATION

Mount Vernon, Ohio — PLANTS — Grove City, Pennsylvania

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Investment Building Washington, D. C.
640 East 61st St. Los Angeles, Calif.
201 East 1st St. Tulsa, Oklahoma
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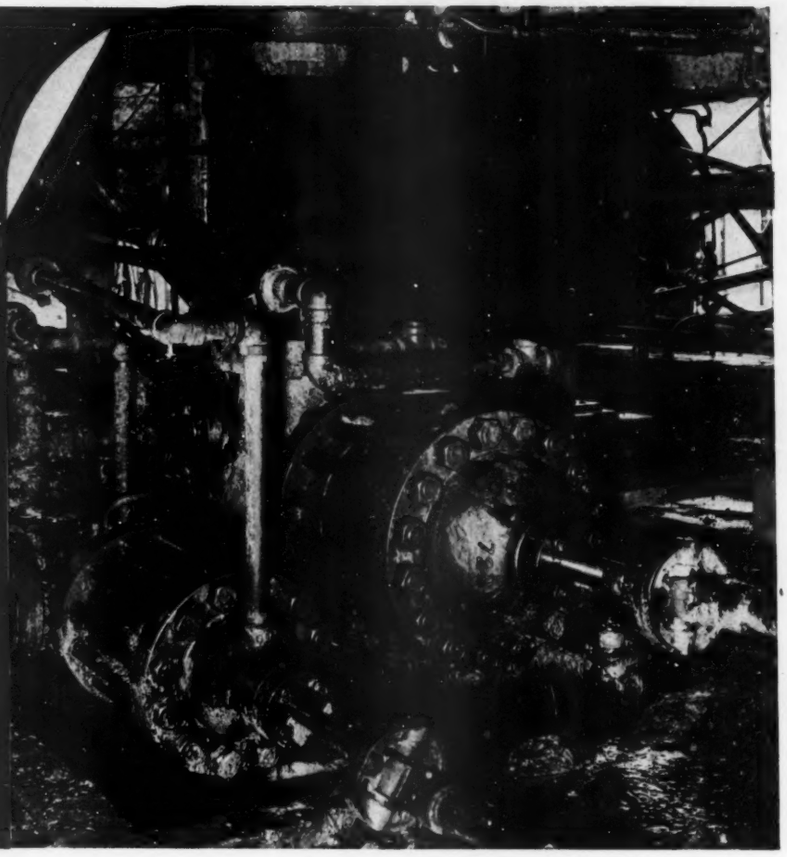
DO YOU HAVE MASTERY— OR ONLY A MASTER VALVE ?



Take your own drilling control hook-up . . . does it include a conventional "Master Valve" or do you have the complete MASTERY over vicious well pressures provided only by a Cameron Pressure Operated Gate Valve?

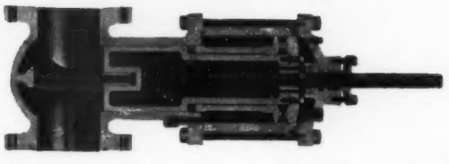
Mechanically, and from the standpoint of your own safety and control, there is no other unit to compare with a Cameron Pressure Operated Gate Valve. Study the cross-section illustration at right. Note the single seat, and the massive ram-gate with *self-feeding packing* which moves against the seat when pressure is applied and effects an instant closure. Even though the seat should be roughened, corroded or sand cut, the Cameron *self-feeding packing* automatically feeds out and fills up inequalities. Seal is instantaneous and absolutely positive.

Here is a control valve with no delicate sealing surfaces, designed in every particular to eliminate possibility of failure to shut off when needed. Surely the world's best and most positive gate valve is not too good for the protection of your expensive rigs and costly well bores, so let us send you full details of the Cameron Pressure Operated Gate Valve. They will gladly be supplied without obligation.

Estudie el gobierno de su propio sistema de perforación . . . . ¿comprende la corriente "válvula principal," o cuenta Vd. con el completo DOMINIO sobre las peligrosas presiones de pozo, que se logra sólo con una válvula de compuerta Cameron accionada por presión?

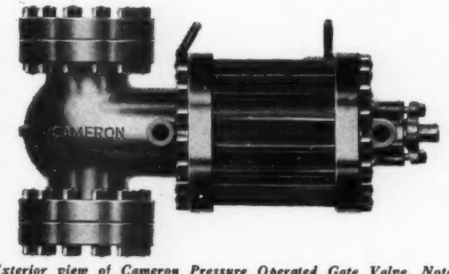
Mecanicamente, y desde el punto de vista de su propia seguridad y gobierno, no hay ninguna otra unidad que se compare con la válvula de compuerta Cameron accionada por presión. Estudie el diagrama de la sección transversal, que mostramos a la derecha. Tome nota del asiento simple y de la maciza compuerta, similar a un ariete, con *empaquetadura de alimentación automática*, que se mueve contra el asiento cuando se aplica la presión, efectuando un cierre instantáneo. Aun cuando el asiento estuviera corroido o picado por la arena, la *empaquetadura de alimentación automática* de la Cameron compensa siempre, de una manera absolutamente automática, todas las desigualdades o irregularidades. El cierre es instantáneo y positivo.

Aquí está una válvula de gobierno que no tiene delicadas superficies de cierre, y que está proyectada, en todo sentido, para eliminar la posibilidad de falla en cerrarse bien cuando se necesite. Ciertamente que la mejor válvula de compuerta del mundo no es demasiado buena para la protección de sus costosos aparejos o torres y no menos costosos equipos de perforación de pozos. Permítanos enviarle información completa sobre la válvula de compuerta Cameron accionada por presión. Se la suministraremos incondicionalmente.



When fluid pressure is applied to closing side of ram-gate operating piston, ram-gate moves swiftly across horizontal bore and seals instantly on single seat formed integrally with self-cleaning gate cavity.

Cuando se aplica la presión líquida, al lado de cierre del émbolo de la compuerta, la compuerta se mueve rapidamente, en sentido horizontal, en el cilindro y cierra instantaneamente el asiento simple, el cual forma parte integrante de la cavidad de limpieza automática de la compuerta.



Exterior view of Cameron Pressure Operated Gate Valve. Note closing and opening ports which require a very simple manifold. Control is by means of a 4-way control valve. Operation is instantaneous and exceedingly positive.

Vista exterior de la válvula de compuerta Cameron accionada por presión. Tome nota de los orificios de abertura y cierre, los cuales requieren un múltiple muy sencillo. El gobierno se efectúa por medio de una válvula de cuatro vías. El funcionamiento es instantáneo y positivo.

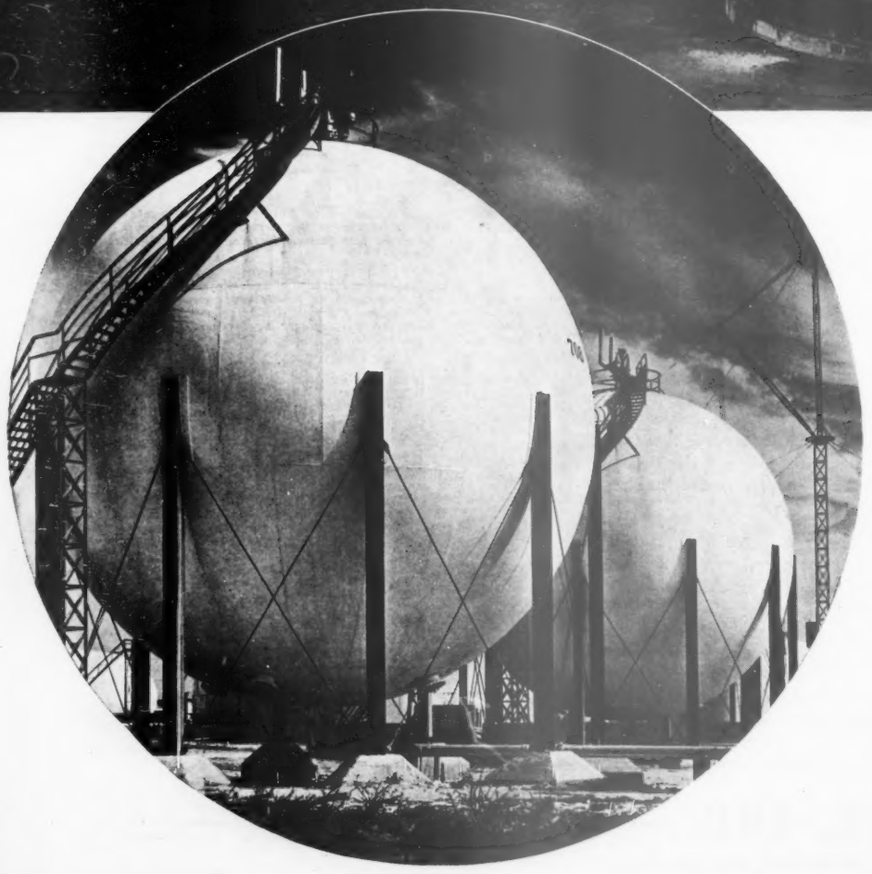
CAMERON IRON WORKS, INC. 711 MILBY STREET, HOUSTON, TEXAS

Export: 74 Trinity Place, New York, N. Y.
California Distributor: The Howard Supply Company, Los Angeles
Oklahoma Representative: Paul Edkin, Tulsa

"BE WISE . . . CAMERONIZE"

Modern Oil Storage

(EQUIPO MODERNO PARA ALMACENAR PETROLEO)



● La lámina precedente muestra algunos de los veintidós Hortonspheroids (Esferoides Horton) que se encuentran instalados en una refinería de las Antillas, todos los cuales se usan para almacenar gasolina. Estos esferoides tienen capacidades de 80.000 y 100.000 barriles, respectivamente, y están diseñados de suerte que puedan resistir una presión interna de 5 libras y 2½ libras por pulgada cuadrada, respectivamente. Las dos Hortonspheres (Esferas Horton) que se muestran a la izquierda son construcciones de 52 pies de diámetro, instaladas en la misma refinería con el fin de almacenar naftas ligeras a presión de 20 a 35 libras por pulgada cuadrada.

Designed to Combat Evaporation Loss!

Destinado a Combatir las Pérdidas Debidas a la Evaporación

CHICAGO BRIDGE

Fabricating Plants in BIRMINGHAM, CHICAGO and GREENVILLE, PA.

LICENSEES: Horton Steel Works, Limited, Fort Erie, Ontario, Canada; The Motherwell Bridge & Engineering Co., Ltd., Motherwell, Scotland; The Whessoe Foundry & Engineering Co., Ltd., London, England; Worms & Cie., Paris, France; Campagnia Tecnica Industrie Petroli S.A.I., Rome, Italy.

Acme's Mud Collar Accomplishes *More* for Rotary Drillers than Promised

1

2

3

4

Since announcing Acme's "Wonder Tool," experiences of users have revealed added advantages for *hard* and *sticky* formation drilling. Yes! It will do MORE than first promised or hoped.

HARD FORMATIONS: Acme's MUD COLLAR assures faster cutting, longer runs, better hole and less drill pipe torque. The 6 high-velocity fluid streams keep the cutters clean, and instantly wash cuttings off bottom, making cutting faster and freer. They also "lubricate" and keep fresh cuttings out of bit bearings, increasing bearing life, resulting in fewer green bits and longer runs.

STICKY FORMATIONS: The Acme MUD COLLAR gives all of these same advantages in drilling sticky formations, plus the other very important service of preventing bits "balling up" and "mud rings" forming.

Order through your Supply Store, or write TODAY for full information on this "Modern Marvel Tool."

Distributors for State of California: Vernon Tool Co., Ltd., Los Angeles

Rinde más que lo prometido en beneficio de los que perforan según el sistema rotativo

Key to Illustrations:
Clave de los grabados:

1 — Acme's *Mud Collar* — with bit assembled — "ready for action."

1—Collar Acme para lodo, con la barrena instalada—listo para trabajar.

2 — Acme's *Mud Collar* — "in action" — 6 fluid streams keep bit clean.

2—Collar Acme para lodo, en acción, con sus seis chorros para conservar limpia la barrena.

3 — Acme's *Mud Collar* — on the job. Note clean bit as it has just come from hole.

3—Collar Acme para lodo en acción. La barrena recientemente sacada del agujero, se ve muy limpia.

4 — Note Mud Ring. The *Mud Collar* would have eliminated this.

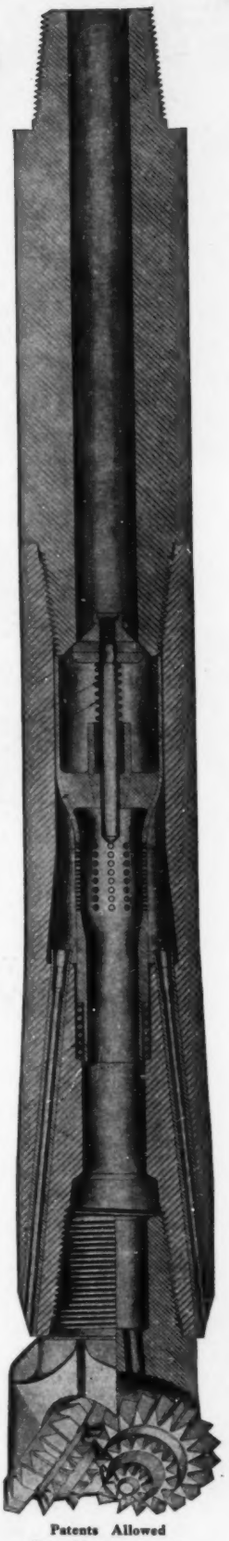
4—Tome nota del anillo de lodo. El collar para lodo habría evitado todo esto.

Desde que anunciamos la "Herramienta Maravillosa" Came, la experiencia de los que la usan ha revelado adicionales ventajas para la perforación en formaciones duras y dificultosas. En realidad, esta herramienta ha hecho mucho más que lo prometido o anticipado.

FORMACIONES DURAS: El collar Acme para lodo asegura corte más rápido, mayor duración efectiva, mejor agujero y menos esfuerzo de rotación de tubo de perforación. Las 6 corrientes de líquido de alta velocidad mantienen limpios los cortadores y lavan instantaneamente las partículas del fondo, impartiendo facilidad y rapidez a la perforación. También lubrican y excluyen las partículas de los cojinetes de la barrena, prolongando la duración de los cojinetes, de lo cual resulta un mayor rendimiento y duración efectiva de las barrenas.

FORMACIONES PEGAJOSAS: El collar Acme para lodo da todas estas mismas ventajas en la perforación de formaciones pegajosas, además del importante servicio de evitar que las barrenas se atasquen y formen anillos de lodo.

Compre estas herramientas de nuestra oficina de exportación, cuya dirección anotamos abajo, o solicite información completa sobre las mismas.



Patents Allowed
Protegida por patente.

ACME FISHING TOOL CO.

PARKERSBURG, West Va.
Export Office: 19 Rector St.
New York, N. Y. U. S. A.

ACME DRILLING & FISHING TOOLS

BADGER

...if you want specialties such as Houdry and Edeleanu.

BADGER

...if you want the more general types such as Topping Units, Atmospheric and Vacuum Units, Solvent Extracting and Dewaxing Units, Asphalt Units, Rerun Units of all types, Thermal Cracking Units, Viscosity Breakers.

BADGER

. . . si Vd. quiere especialidades como las de Houdry y Edeleanu.

BADGER

. . . Si Vd. quiere los tipos más generalizados, tales como unidades de destilación de gasolina por "topping", unidades atmosféricas y de vacío, unidades para la extracción de disolvente y desparafinación; unidades de asfalto, unidades de redestilación de todo tipo, unidades de desintegración o cracking termal, modificadores de viscosidad.

Un completo servicio ofrecido con expertos ingenieros químicos, que cooperan con los igenieros de petróleo, constratistas de construcción, para llevar a cabo la realización de los proyectos, y operarios para hacer funcionar las unidades o instalaciones satisfaciendo todas las garantías. Rápida acción? Ciertamente, pero es acción en combinación con mucho cuidado.

Agentes de permiso del procedimiento Houdry de desentigración o cracking catalítico.

Ingenieros y contratistas
para equipo de destilación y refinería de petróleo

A complete service offered with experienced chemical engineers cooperating with petroleum engineers, construction crews to carry out their plans and operating men to put the plant or units through their paces with guarantees fully met. Fast action? Certainly, but action coupled with care!

•

Licensing Agents for the Houdry Catalytic Cracking Process

E. B. BADGER & SONS CO.

Boston, Mass.

New York Philadelphia San Francisco London Paris

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Engineers and Contractors
for Petroleum Distillation and Refinery Equipment

Foreign Operators

H.C.SMITH ROCK BITS

FOREIGN OPERATORS

Dull cutters on the H. C. Smith Type 5 rock bit (bent pin type) can be replaced with new cutter assemblies in your own shops at a substantial saving.

Write for descriptive folder.

COMPANIAS EXTRANJERAS

Las fresas sin filo de las barrenas de roca H. C. Smith tipo 5 (tipo de pasador doblado) pueden ahora ser renovadas con nuevos grupos de fresas en su propio taller, con una considerable economía de gastos.

Pídanos folleto descriptivo.

H C Smith Oil Tool Co.

GENERAL OFFICES AND PLANT - P. O. BOX 431, COMPTON, CALIF.

Export Representative:

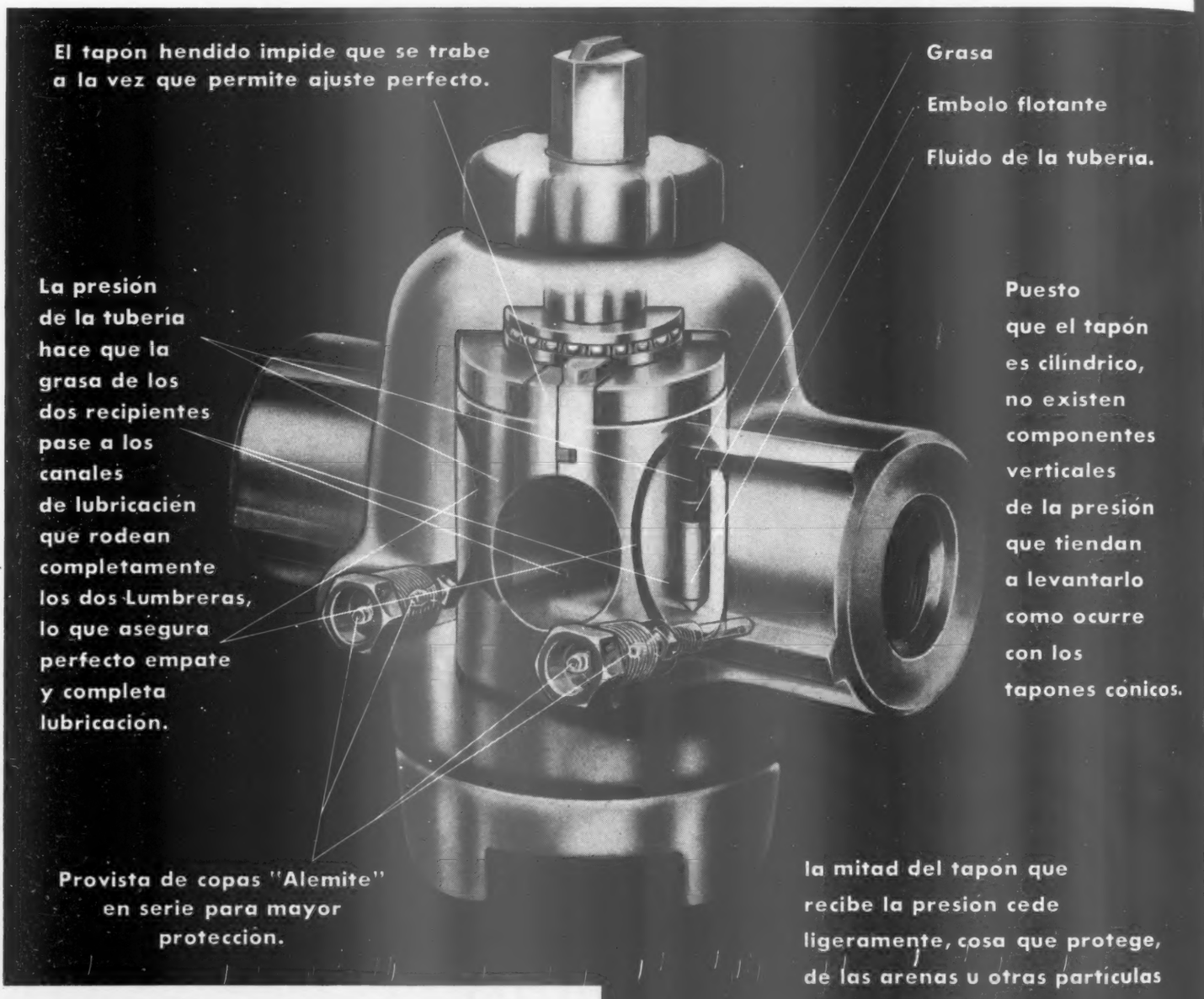
VAL R. WITTICH · 30 ROCKEFELLER PLAZA · NEW YORK, N. Y., U. S. A.

This is the new Mission Plug Valve:

The illustration explains clearly why its exclusiv line pressure operated, full-port lubrication re duces wear, increases the life of the valve an maintains a perfect seal.

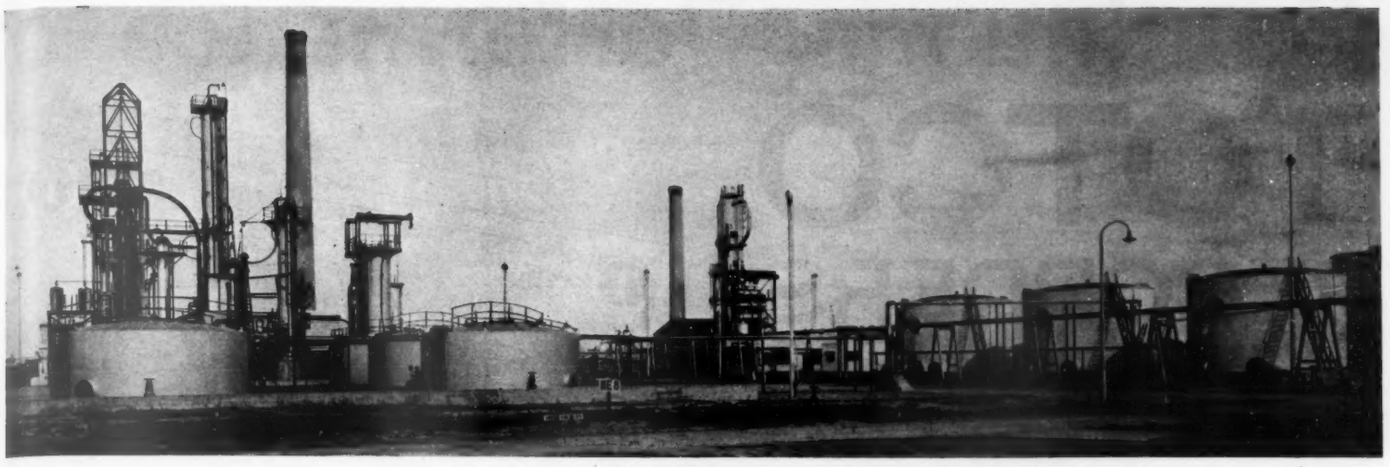
He aquí la nueva válvula marca "Mission"

La ilustración muestra cómo su sistema de com pleta lubricación al rededor de los lumbrera po medio de la presión del fluido de la tubería disminuye el desgaste, prolonga la vida de l valvula, y proporcióna un cierre perfecto.


El tapón hendido impide que se trabe a la vez que permite ajuste perfecto.
Grasa
Embolo flotante
Fluido de la tubería.
La presión de la tubería hace que la grasa de los dos recipientes pase a los canales de lubricación que rodean completamente los dos Lumbreras, lo que asegura perfecto empate y completa lubricación.
Puesto que el tapón es cilíndrico, no existen componentes verticales de la presión que tiendan a levantarlo como ocurre con los tapones cónicos.
Provista de copas "Alemite" en serie para mayor protección.
la mitad del tapón que recibe la presión cede ligeramente, cosa que protege, de las arenas u otras partículas duras, las superficies.

MISSION MANUFACTURING CO.

HUMBLE ROAD • HOUSTON, TEXAS • NEW YORK EXPORT OFFICE: 30 ROCKEFELLER PLAZ



TYPICAL CRACKING PLANT
Part of a complete petroleum refinery in South America designed and built by Foster Wheeler

TIPICA PLANTA DE DESINTEGRACION O CRACKING
Una parte de completo refinería en América del Sur proyectado y construido por Foster Wheeler

Refinerias Completas
Complete Refineries

Polymerization plants	Instalaciones de polimerización
Iso-Octane Plants	Instalaciones de iso octano
Cracking and Reforming units	Unidades de cracking y reformación
Crude Oil and Gasoline Stabilization plants	Instalaciones de estabilización de petróleo crudo y gasolina
Continuous Coking Process Hydraulic Decoking Viscosity Breaking	Procedimiento de coquificación contínuo Descoquificación hidráulica Alteración de viscosidad
Isomerization	Isomerización
Continuous Sweetening plants	Instalaciones de tratamiento destufador contínuo
Liquid butane and propane units	Unidades de butano y propano líquido
Solvent lube oil Extraction Furfural refining	Extracción de aceite lubricante por solvente Refinación furfural

DESAROLLO
INVESTIGACION
EXPERIMENTOS
ESTUDIO DE PROCEDIMIENTOS
PROYECTOS MECANICOS
INGENIERIA
FABRICACION
CONSTRUCCION
OPERACION
MANUFACTURA DE GASOLINA DE AVIACION Y LUBRICANTES

DEVELOPMENT
RESEARCH
EXPERIMENTAL
PROCESS DESIGN
MECHANICAL DESIGN
ENGINEERING
FABRICATION
CONSTRUCTION
OPERATION
AVIATION GASOLINE and LUBRICANT PROCESSING

Filtrol fractionation	Fraccionación por filtrol
Alkylation	Alcalización
Continuous acid treating of all oils	Tratamiento contínuo al ácido de todos los petróleos
Absorption and Compression Gas Plants	Instalaciones de absorción y compresión de gas
Solvent Dewaxing Plants M-E-K Benzol Dewaxing	Instalaciones de desparafinación por solvente Desparafinación por benzol M-E-K
Hydrogenation units	Unidades de hidrogenación
H_2S Removal Gas or liquid phases	Remoción del H_2S Fases de gas o de líquido
Low Temperature Cracked Gasoline Rerun	Destilación secundaria de gasolina desintegrada, a baja temperatura
High Vacuum Lube Rerun	Destilación secundaria de lubricante a gran fuerza de vacío
Vacuum flash asphalt units	Unidades de asfalto al vacío

FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK, N. Y.

FOSTER WHEELER

Continuous Performance of TOTCO RECORDERS

for Controlled Vertical Drilling

INSURED BY THIS WORLD-WIDE GUARANTEE

GUARANTEE
The Totco Recorder Instrument is guaranteed for a period of one year, when sold for use outside of the United States, and will be repaired at our laboratory or replaced free of charge should it fail to operate or to maintain its accuracy, when run and cared for according to the instructions contained in the Totco Catalog and Operating Manual.
TECHNICAL OIL TOOL CORPORATION, LTD.
TOTCO

GARANTIZA
El instrumento registrador Totco se garantiza por un período de un año, cuando se vende para uso afuera de los Estados Unidos de América, y se reparará en nuestro laboratorio o se repondrá libre de gasto en caso de que deje de funcionar o deje de conservar su exactitud, al ser usado y cuidado de acuerdo con las instrucciones que damos en el catálogo y manual de instrucciones Totco.
TECHNICAL OIL TOOL CORPORATION, LTD.
TOTCO

A special, strongly constructed mailing tube for the Totco Recorder Instrument is included in each export shipment. The Instrument weighs only 12 ounces.

El instrumento registrador Totco se envía, para le exportación, muy bien protegido en un tubo bien firme, especialmente construído para su envío por correo. El instrumento pesa solo 12 onzas.

TOTCO LABORATORY SERVICE AVAILABLE TO OPERATORS EVERYWHERE

During the past three years, nearly 100 Totco Recorders have been purchased for use in oil fields outside of the United States. Of these, only 20 have required adjustment or repair from all causes, including accidental damage, and have been returned to our laboratory, which is the only place where the sealed instrument can be serviced.

Modern air mail service makes the Totco Laboratory quickly available to operators everywhere. A Totco Recorder, recently air mailed to the laboratory from New Zealand, was immediately repaired and returned by air mail, the round trip requiring only three weeks.

The Totco Recorder is more than a drift indicator; it is an aid in drilling fast, economical, vertical wells. The *guaranteed performance* of the Totco Recorder and the readily available laboratory service saves money and time for the operator in foreign oil fields, and assures him of continuous, profitable use of his Totco equipment. A superintendent from a foreign field recently reported that in 400 runs of his Totco Recorder, 400 perfect records were obtained. You, too, can secure efficient, economical, and accurate results with a Totco Recorder. Inquire among the men in your affiliated companies as to Totco performance. Send for complete information.

SERVICIO DE LABORATORIO TOTCO A LA DISPOSICION DE LOS INTERESADOS EN TODAS PARTES

Durante estos últimos tres años, casi 100 registradores Totco se han vendido para uso afuera de los Estados Unidos de América. De todos éstos, solo 20 han necesitado rectificación o reparacion, por causas diversas, incluyendo daños acidentales, devolviéndose a nuestro laboratorio, que es el único punto donde el instrumento sellado puede reponerse o repararse.

El moderno servicio postal aéreo pone el servicio del Laboratorio Totco al rápido alcance de todos los interesados en el extranjero. Un registrador Totco, recientemente enviado por corre aéreo, a nuestro laboratorio, por un cliente en Nueva Zelandia, fué inmediatamente rectificado y devuelto también por correa aéreo, tomando el viaje de ida y vuelta sólo tres semanas.

El registrador Totco es mucho más que un indicador de desviación. Es una gran ayuda para la rápida y económica perforación de pozos verticales.

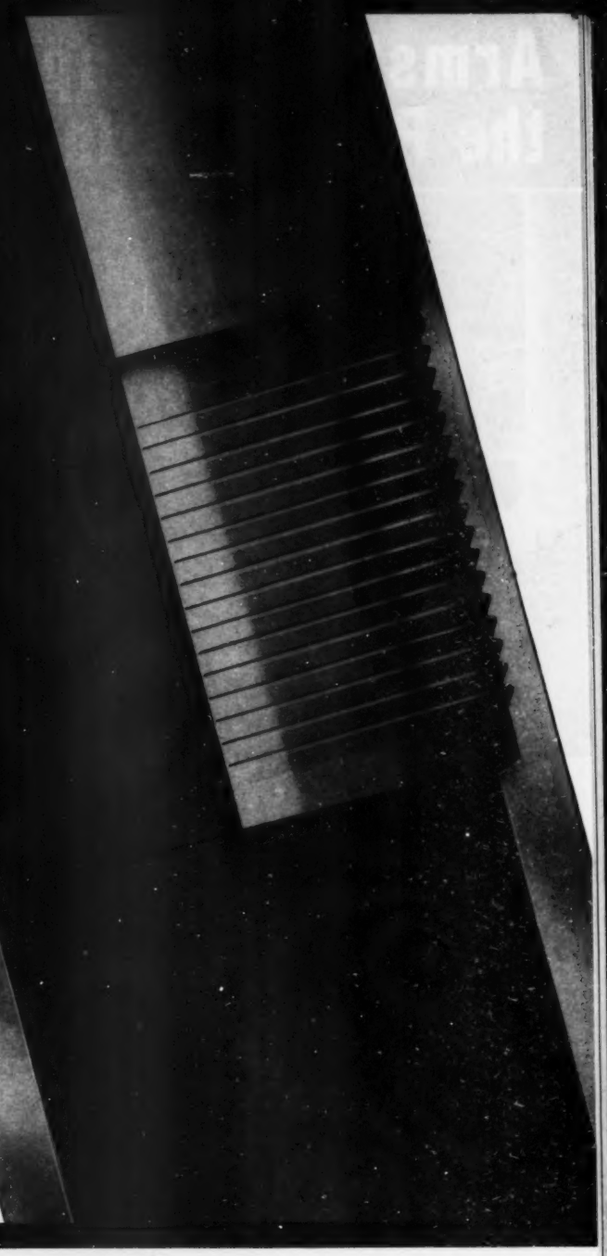
El *funcionamiento garantizado* del registrador Totco y el servicio de laboratorio rápido y eficaz que se suministra con cada instrumento, ahorran tiempo y gastos a los dueños en el extranjero, aseguarándoles un uso contínuo y lucrativo de su equipo Totco. Un superintendente de un campo petrolífero en el extranjero nos comunicó, hace poco, que en 400 aplicaciones de su registrador Totco había obtenido 400 acusaciones perfectas. Vd. también, podrá contar con la seguridad de resultados eficaces, económicos y exactos con un registrador Totco. Pregunte a sus amigos que tengan un Totco qué piensan del servicio de este admirable instrumento. Pídanos información completa.

TECHNICAL OIL TOOL CORP., Ltd.

1311 NORTH HAVENHURST DRIVE, LOS ANGELES, CALIFORNIA, U.S.A.

Exclusive Export Representative: (Except in Canada) LUCEY EXPORT CORPORATION. *Exclusive Canadian Representative:* OIL WELL SUPPLY COMPANY

THE SECURITY FLUSH JOINT THREAD



CUATRO RASGOS QUE AHORRAN COSTO DE TUBERIA

1. REBORDE EXTERIOR BISELADO—Evita el "ensanchamiento" bajo las cargas máximas . . . da mayor apretadura a las roscas . . . forma un soporte adicional en la pase del pasador . . . provee un cierre adicional al líquido.

2. ROSCAS CONICAS LARGAS—Se centran automaticamente al juntarse . . . forman una superficie de contacto apretada . . . casi suprime el daño a la unión al formarse.

3. NINGUN BORDE AGUDO—Los bordes curvos y suaves de las roscas evitan la formación de particulas metálicas . . . eliminan el desgaste de las roscas.

4. REBORDE SECUNDARIO—Provee un asiento para el extremo de la sección de pasador . . . da firme sujeción a la unión . . . produce máxima firmeza para resistir la compresión, torcedura y dobladura ejercidas por las cargas.

FOUR FEATURES SAVE PIPE COSTS!

1. BEVELED OUTER SHOULDER—Prevents "belling" under peak torque loads . . . draws threads into closer engagement . . . forms extra support at base of pin . . . provides a secondary fluid seal.

2. LONG, TAPERED THREADS—Automatically centralize when stabbed . . . form a tight contact surface . . . practically eliminate joint injury on make-up.

3. NO SHARP CORNERS—Round, smooth thread corners prevent formation of metal slivers . . . eliminate thread galls.

4. SECONDARY SHOULDER—Provides a seat for the end of pin section . . . holds joint rigid . . . gives maximum strength to resist compression, torsion and bending loads.

La rosca Security de unión lisa es económica y eficaz. Ha sido completamente ensayada y demostrada en laboratorios y trabajo práctico.

La rosca Security de unión lisa se ofrece en los tubos SECURALOY lo mismo que en los tubos de acero, en una gran escala de tamaños populares. La rosca puede reproducirse facilmente en los talleres de campo petrolífero, con un alto grado de exactitud—cosa muy importante al tratarse de explotaciones en el extranjero.

El boletín 1-A de la Security Engineering contiene 20 páginas de información relativa a los rasgos exclusivos de la rosca Security de unión plana, junto con datos y tablas de caracter técnico. Gustosamente enviaremos ejemplar a solicitud. La rosca Security de unión lisa se describe también en el Catálogo Compuesto de 1940 y Directorio de Equipo de Producción.

The Security Flush Joint Thread is economical and efficient. It has been thoroughly tested and proven under laboratory and field conditions.

The Security Flush Joint Thread is available in both SECURALOY and steel pipe in a wide range of popular sizes. The Thread can be easily reproduced in field shops to a high degree of accuracy—an important feature in overseas operations.

Security Engineering Bulletin 1-A contains 20 pages of information describing the unique features of the Security Flush Joint Thread, together with Engineering Test Data and Charts. It will gladly be sent on request. The Security Flush Joint Thread is also described in your 1940 Composite Catalog and Producing Equipment Directory.

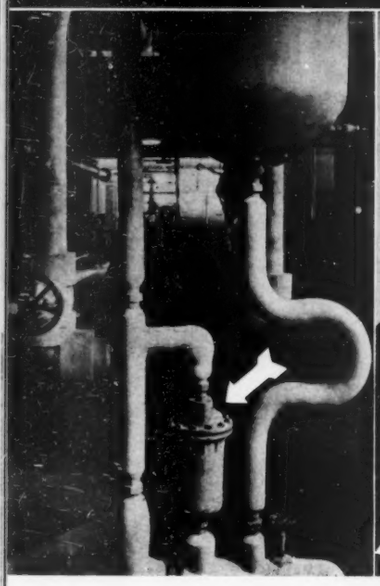
SECURITY ENGINEERING CO., INC.

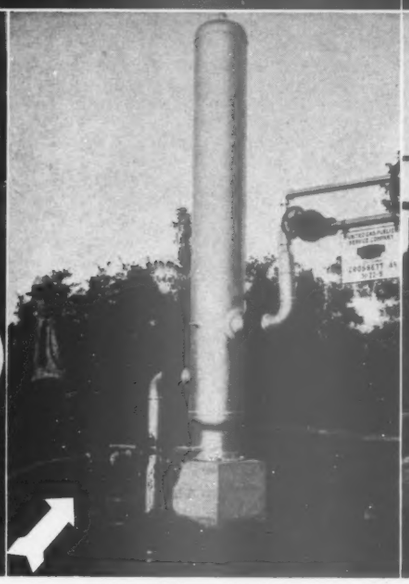
BAKERSFIELD, PHONE 5120-1 • WHITTIER, CALIFORNIA, PHONE 42004 • VENTURA, PHONE 3285
MID-CONTINENT: 5525 CLINTON DR., HOUSTON, TEX., PHONE CAPITOL 9538 • CENTRALIA, ILLINOIS, P.O. BOX 283
EXPORT: SECURITY ENGINEERING CO., INC., 420 LEXINGTON AVENUE, NEW YORK CITY

Sievers Reamers ★ *Securaloy* ★ *Security Drillable Products*

Armstrong Traps for the Petroleum Industry

Trampas Armstrong para la Industria Petrolera





● As suggested by the above pictures, Armstrong Traps are used in all branches of the oil industry. This wide acceptance is very largely due to their dependable performance. Without exception, all Armstrong traps are fully guaranteed for quality and each user is guaranteed complete satisfaction. Armstrong representatives are located in principal centers throughout the world with many sizes of traps in stock for immediate use. The table below lists the most common sizes. Traps for higher pressures are listed in our catalog and manual illustrated at right—copies of which will be sent free on request.

● Como lo indican las fotografías, las trampas de vapor ARMSTRONG se emplean en todas las ramas de la industria petrolera. Esta amplia aceptación se debe principalmente a su funcionamiento seguro.

Todas las trampas de vapor ARMSTRONG, sin excepción alguna, llevan nuestra garantia de calidad superior; y todo comprador tiene, asi, la seguridad de quedar completamente satisfecho. Los representantes de la ARMSTRONG en las principales ciudades del mundo tienen en existencia un amplio surtido de tamaño de nuestras trampas para entrega inmediata. La tabla que aparece abajo contiene los tamaños más corrientes.

Las trampas para presiones mayores se describen en nuestro catálogo y manual representado abajo, del cual gustosamente le enviaremos un ejemplar a quien se sirva solicitarlo.

ARMSTRONG
MACHINE WORKS
868 Maple Street
Three Rivers, Mich., U.S.A.
Cable Address:
"Armtrap Three Rivers, Michigan"
Bentley's Code

Trap Size	Tamaño de la Trampa	800	801	211	212	213	214	215	216	313	315	316
Pipe connections	Conexiones para las Tuberías	½"-¾"	½"-¾"	½"	½"-¾"	½"-¾"	1"	1"-1¼"	1½"-2"	½"-¾"	1"-1¼"	1½"-2"
List prices	Precio de Catálogo, Trampa Standard	$7.00	$7.00	$9.25	$15.00	$20.75	$29.00	$38.00	$55.00	$50.00	$80.00	$150.00
Telegraph code	Palabra Telegráfica	Aloe	Arrow	Aspen	Birch	Walnut	Hemlock	Larch	Tamarack	Barium	Bismuth	Boron
Height	Altura	5⅛"	6"	6⅜"	8"	10¼"	12½"	14"	16¾"	11⅜"	15"	16¾"
Diameter	Diámetro	3¾"	3¾"	4⅛"	5"	6⅜"	7½"	8½"	10⅛"	8"	9⅛"	11⅜"
Weight	Peso	4½ lbs.	4½ lbs.	5½ lbs	10½ lbs.	19 lbs.	32 lbs.	47 lbs.	76 lbs.	47 lbs	92 lbs	160 lbs.
Max. Press, lbs. sq. in.	Presión Máxima, Lbs.	125	125	200	200	250	250	250	250	600	600	600
Continuous Discharge capacity in Lbs. of water per hour at pressures indicated in Lbs. per sq. in.	Capacidad de descarga continua en lbs. de agua por hora a las presiones indicadas en lbs. por pulg. cuad. 5 lbs.	450	450	830	1600	2900	4800	7600	14500	----	----	----
	10	560	560	950	1900	3500	5800	9000	17300	----	----	----
	15	640	640	1060	2100	3900	6500	10000	19200	----	----	----
	20	690	690	880	1800	3500	6000	8500	18500	----	----	----
	25	460	460	950	1900	3800	6500	9200	20000	----	----	----
	30	500	500	1000	2050	4000	6800	9800	18000	----	----	----
	40	550	550	770	1700	3800	5800	8300	20000	----	----	----
	50	580	580	840	1900	4100	6300	9000	18200	----	----	----
	60	635	635	900	2000	4400	6800	9500	19800	----	----	----
	70	660	660	950	2200	3800	6000	9200	18300	----	----	----
	80	690	690	800	1650	4000	6400	9700	19000	----	----	----
	90	620	620	830	1730	3400	5900	10000	17500	----	----	----
	100	640	640	860	1800	3600	6200	10400	18000	----	----	----
	125	680	680	950	2000	3900	6700	10900	20000	----	----	----
	150	----	----	810	1500	3500	5700	9500	18500	----	----	----
	200	----	----	860	1600	3200	5300	9200	17500	----	----	----
	250	----	----	900	1680	3500	5700	7000	19000	----	----	----
	300	----	----	----	----				----	2800	7500	16000
	400	----	----	----	----				----	3200	6900	13800
	500	----	----	----	----				----	2250	7400	14800
	600	----	----	----	----				----	2450	5600	14000

● Para la conveniencia de los ingenieros, maestros mecánicos y demás personas de habla española que tengan algo que ver con trampas de vapor, se ha traducido al castellano el LIBRO ARMSTRONG SOBRE TRAMPAS DE VAPOR. Se le enviará gratuitamente un ejemplar de estte libro si tiene la bondad de indicarnos su nombre, la capacidad de la caldera, la presión de vapor que se mantenga en la caldera, y el producto manufacturado por usted. Consiga su ejemplar del LIBRO ARMSTRONG SOBRE TRAMPAS DE VAPOR, dirigiéndose a cualquiera de las casas siguientes, o escriba a ARMSTRONG MACHINE WORKS, 868 Maple St., Three Rivers, Michigan, E.U.A.

ARGENTINA
Will L. Smith, S. A.
Luis Saenz Peña,
443-7
Buenos Aires, Argentina

BRAZIL
Bert Keller
Caixa Postal 1975
Sao Paulo, Brazil

CHILE y BOLIVIA
Gregorio Kogan
Casilla De Correo
No. 594
Valparaiso, Chile

CUBA
George B. Allan
1017 Main Street
Dallas, Texas, E.U.A.

URUGUAY
Will L. Smith, S. A.
Calle Uruguay 1183
Montevideo, Uruguay

VENEZUELA
Joaquín Avellán
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Caracas, Venezuela

ARMSTRONG TRAPS

Automatic Drainage for

REFINERIES • GAS PIPE LINES • DRILLING RIGS

SOLVE YOUR INDIVIDUAL PROBLEMS

FOR *Hard* CONSTANT DRILLING—IN EVERY FIELD IN EVERY SITUATION...

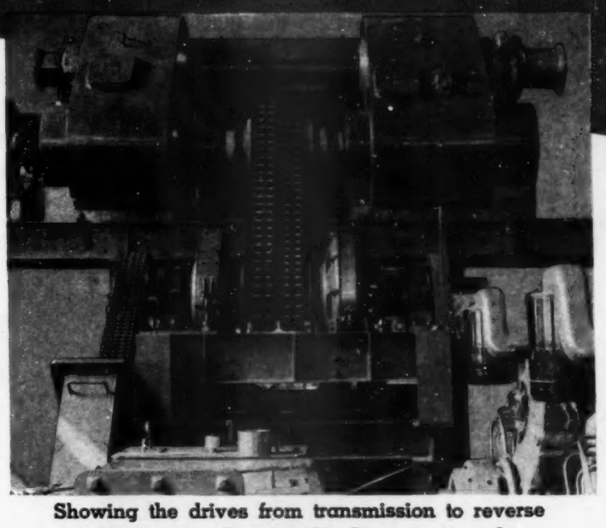
DRAWWORKS. New Model EC-54-8. Has eight hoisting speeds and two rotary speeds. Equipped with interchangeable roller bearings on line and jack shafts. Press-forged brake rims are water cooled. Hydromatic brake is connected to drumshaft through flexible type cut-out coupling. Pressure spray lubrication to all drives. Double 3⅛" pitch chain used throughout except on rotary drive.

TRANSMISSION. Type KM-1 using rigidly mounted SKF self-aligning bearings. Two oil pumps provide continuous pressure spray lubrication. Quadruple 1½" pitch extra-heavy chain used on compounding drive.

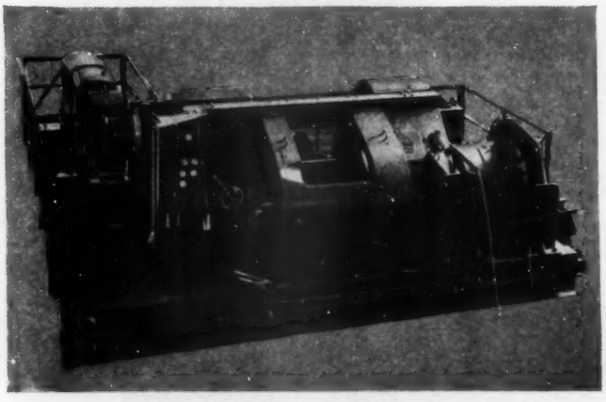
REVERSE AND FRICTION CLUTCH. Type JA. Equipped with 36" diameter Twin Disc Clutch, rated 800 h.p. at 372 r.p.m., with safety factor of 2½. Planetary type reverse gear. Provides easy and instantaneous reverse with convenient controls operating hydraulic booster system.

FLOOD LUBRICATION. Entire drilling plant is flood lubricated including rotary drive, drawworks, reverse gear and transmission.

SUBSTRUCTURE. The substructure and bases of each individual unit are designed to be bolted together rigidly with least possible confusion. All supporting members are extra heavy to withstand the heaviest loads. Design of the substructure is such that the power plant, transmission and slush pump are at ground level affording firm footing and a minimum slush pump suction lift.



Showing the drives from transmission to reverse gear, thence to drawworks. In operation these drives are enclosed and pressure spray lubricated.



Centralized controls bring the drilling plant under convenient and easy control. Pressure gauges and other instruments have been located conveniently.

THE CONTINENTAL SUPPLY CO.
General Offices: DALLAS, TEXAS
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CONTINENTAL EMSCO COMPANY, Inc.
30 Rockefeller Plaza New York City, N. Y.
Representatives:
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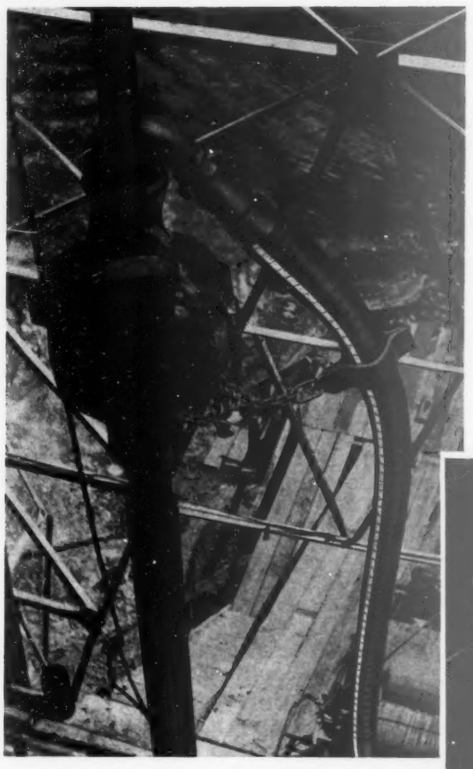
CONTINENTAL EMSCO

Right WITH OIL...

FROM THE GROUND UP!

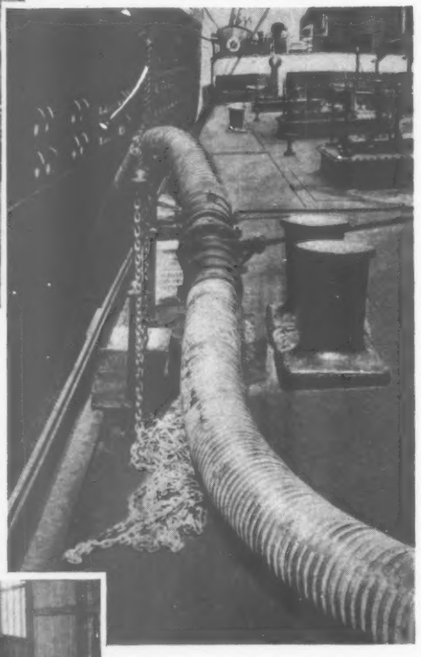


Pumping mud under tremendous pressure . . . Matchless Rotary Hose with Leakproof Coupling! Loading and discharging oil or gasoline from terminals to tankers, and vice versa . . . Amazon Suction and Discharge Hose! Handling oil and oil derivatives from refinery through pipe line, tank car, and tanker . . . a variety of U. S. Rubber Hose and Pump Packings! Speeding discharge of gasoline, through its smooth, synthetic rubber tube, from curb pump to car tank . . . Peerless Gasoline Hose! All doing their jobs . . . and doing them well, because U. S. Rubber engineers have learned about oil from the ground up.

All over the world, in every important oil center, you'll find U. S. Rubber representatives . . . trained consultants in mechanical rubber goods problems . . . ready to help you with your job. Write our branch nearest you, or direct to us.

Taking shock pressures, bruising vibrations, constant flexings . . . MATCHLESS Rotary Hose with Leakproof Coupling help the world drill deeper wells.

Recibiendo las presiones del choque, las vibraciones continuas y las flexiones constantes . . . la manguera de rotativa MATCHLESS con acoplamientos a prueba de escape, ayuda a la industria a perforar pozos más profundos.



Speeding liquid horsepower on its way. Fuel oil being transferred from barge to steamer through "U. S." Amazon Oil Suction and Discharge Hose.

Acelerando la fuerza motriz líquida en su camino. Transferencia de aceite combustible de una barca a un vapor, con la ayuda de una bomba de aspiración y descarga Amazon de la U.S. Rubber.

Handling volatiles is hazardous; so modern refinery pump rooms use only the best packings. This room is 100% equipped with "U.S." Packings.

El manejo de líquidos volátiles es peligroso. Por esta razón, las modernas estaciones de bombas emplean sólo las mejores empaquetaduras. La presente estación de bombas está completamente equipado con empaquetaduras "U.S."

Twist it . . . bend it . . . cold or hot weather . . . U. S. Peerless Synthetic Rubber-Liner Gasoline Hose is always flexible.

Retuérzala . . . dóblela . . . cuando hace calor o mucho frio . . . la maguera de gasolina, con tubo o forro de caucho sintético, U.S. Peerless, es siempre flexible.

INYECCION de lodo bajo tremenda presión . . . con la manguera de rotativa Matchless provista de acoplamiento a prueba de escape. Cargando y descargando petróleo o gasolina, de muelle a buque tanque, o vice versa . . . con la manguera de aspiración y descarga Amazon. Manejando petróleo y derivados de petróleo de la refinería a la línea de tubería, vagones tanques y buque tanque . . . con una variedad de mangueras y empaquetaduras de bombas U.S. Rubber. Acelerando la descarga de gasolina, gracias a su suave tubo de caucho sintéticos, de la bomba de acero al vagón tanque . . . con la manguera de gasolina Peerless. Todas están ocupadas . . . y haciendo muy bien su trabajo, porque los ingenieros de la U.S. Rubber están intimamente al corriente de todo lo relativo al petróleo.

En todas partes del mundo, en todo importante centro de la industria petrolera, hallará Vd. representantes de la U.S. Rubber . . . hombres expertos en resolver cualquier problema relacionado con productos mecánicos de caucho . . . ansiosos de ayudar a Vd. a hacer mejor el trabajo. Escriba a nuestra sucursal más cercana o directamente a nosotros.

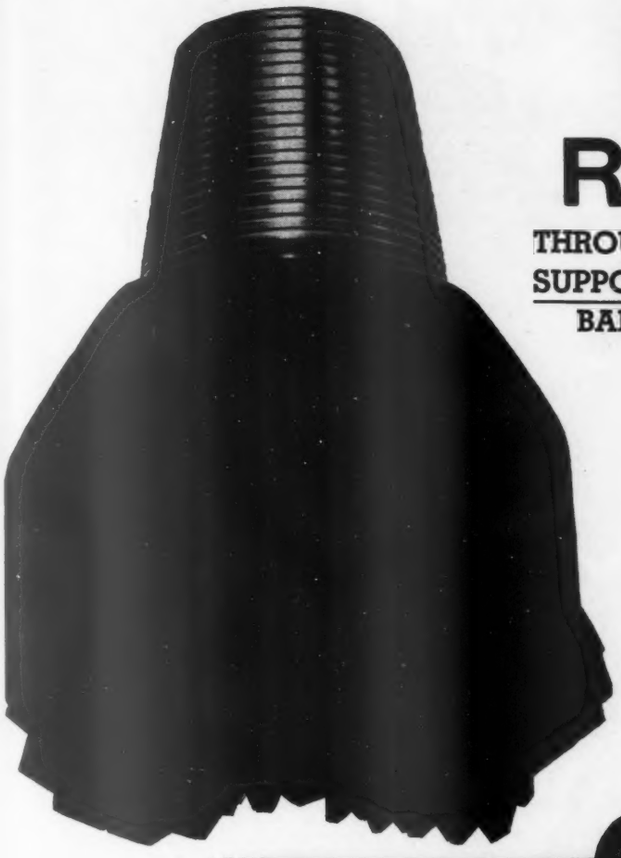
UNITED STATES RUBBER COMPANY

US

TRADE MARK

United States Rubber Export Co., Ltd.

1230 Sixth Ave., New York, N. Y.



REED
ROCK BITS

THROUGH UNITIZATION OF INDEPENDENTLY SUPPORTED CUTTERS, PLUS A COMPLETELY BALANCED BEARING SUPPORT, ASSURE

GREATER SAFETY
GREATER DURABILITY
FASTER CUTTING SPEED
AND
MORE HOLE PER BIT

BARRENAS PARA ROCAS REED

MEDIANTE LA DISPOSICION UNITARIA DE CORTADORES INDEPENDIENTEMENTE SOPORTADOS, MAS UN SOPORTE DE COJINETE COMPLETAMENTE COMPENSADO, SE ASEGURA

MAYOR SEGURIDAD MAYOR DURACION
MAYOR RAPIDEZ DE CORTE
Y
MAS AGUJERO POR BARRENA

UNITIZED

Reed Rock Bits have been designed to give greater service life in all formations. The independently supported cutters, with completely balanced bearing support, are unitized for added strength and greater safety. Hard facing of all cutter teeth with "REEDITE" further lengthens this service life.

The Reed Interchangeable Mud Nozzle Assembly is one of the most important contributions in recent years to rock bit design. These nozzle assemblies are available with jet sizes to accommodate any mud pump capacity or circulation requirements. Sizes available are ⅜" - ½" - ⅝" - ¾" - 1" 1⅛", and may be interchanged at the rig. Available in sizes 5⅛" through 13".

REPLACEABLE MUD NOZZLE ASSEMBLY

Las barrenas para rocas Reed están fabricadas para dar trabajo más durable en toda clase de formación. Los cortadores independientemente soportados, con soporte de cojinete completamente compensado, dispuestos en forma unitaria, dan mayor firmeza y mayor seguridad. El duro revestimiento de los dientes de las barrenas, con material "REEDITE" prolonga más su duración efectiva.

El grupo de boquilla de lodo Reed de tipo intercambiable es una de las contribuciones más importantes de estos últimos años, al perfeccionamiento de la barrena para rocas. Estas boquillas se ofrecen con tamaños de chorro que se adaptan a cualquiera capacidad de bomba de lodo o requisito de circulación. Se ofrecen en tamaños de ⅜, ½, ⅝, ¾, 1 y 1⅛, y pueden intercambiarse en el aparejo. Se ofrecen también en tamaños de 5⅛ a 13".

REED ROLLER BIT COMPANY

P. O. BOX 2119, HOUSTON, TEXAS, U. S. A.

Cable Address: "REEDBIT"

Export Office: 30 Rockefeller Plaza, NEW YORK, N. Y. *Main Plant:* HOUSTON, TEXAS

SUCCESSFUL GEOPHYSICAL SERVICE FOR THE AMERICAS

★ The wide experience gained by UNITED'S field crews in both North and South America is a valuable asset to seismic exploration programs.

Backed by continuous research . . . constant improvement of existing methods . . . and the use of every modern facility for scientific prospecting, UNITED'S thoroughly trained organization has established an outstanding record for successful geophysical surveys.

Complete Information Sent On Request

★ La amplia experiencia de UNITED, obtenida en viajes de reconocimiento por la América del Norte y la del Sur, es una valiosa ventaja para el programa de exploraciones sísmicas.

Apoyado en sus continuas investigaciones, en su constante mejoramiento de los métodos existentes y en el uso de todas las facilidades modernas para exploraciones científicas, el personal de la UNITED, concienzudamente preparado, tiene magnífica hoja de servicios por lo que respecta a inspecciones geofísicas satisfactorias.

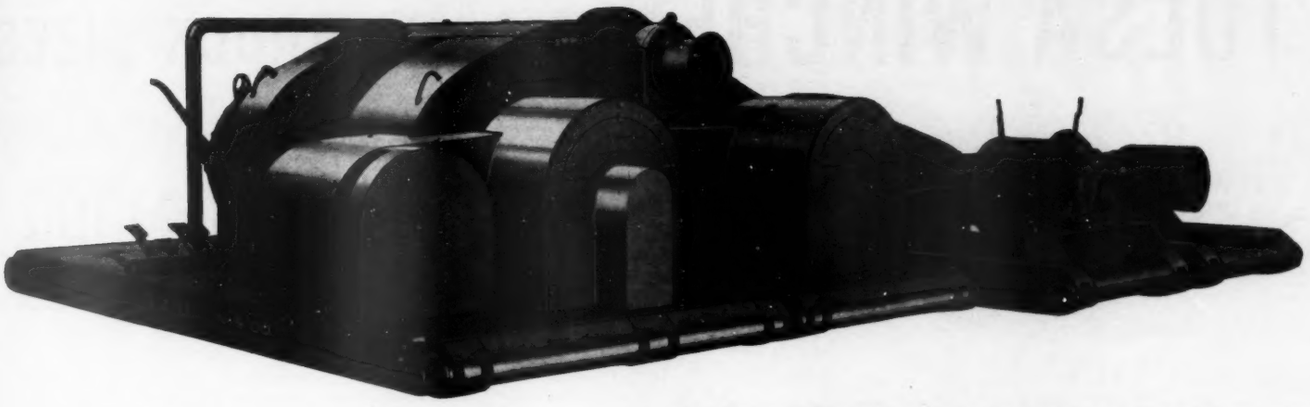
Enviaremos Informes Completos a Quien Los Solicite

UNITED GEOPHYSICAL CO.

HERBERT HOOVER JR., [illegible]

1255 East Green St., Pasadena, Calif. ★ 2406 E[illegible]son Bldg., Houston, Tex.
420 Lexington Ave., New York ★ Rua Mexico [illegible]4, Rio de Janeiro, Brazil

IDEAL CONSOLIDATED RIGS



Size	Capacity
No. 40	4000 Ft.
No. 50	5000 Ft.
No. 75	7500 Ft.
No. 100	10000 Ft.
No. 125	12500 Ft.

(With 4½" Drill Pipe and proportionately deeper with 3½" Drill Pipe.)

You can select an Ideal Rig for practically every rotary drilling requirement with internal combustion engines. Each rig consists of a drawworks and transmission unit, and for easy portability the drawworks is split into two halves which bolt together. Each rig is fitted with a master friction clutch, which combined with friction clutches on the high drives, makes for flexibility and smooth operation. There is a selection of six hoisting speeds and three rotary drive speeds. Adequate lubrication is assured through combination force and gravity system.

APAREJOS DE PERFORACION IDEAL CONSOLIDADOS

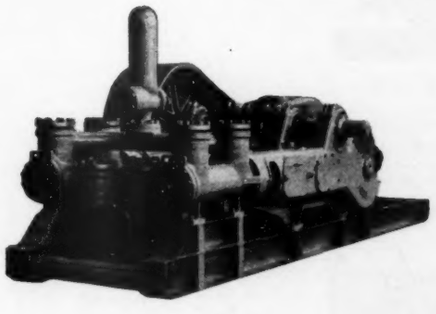
Tamaño	Capacidad
No. 40	4000 piés
No. 50	5000 piés
No. 75	7500 piés
No. 100	10000 piés
No. 125	12500 piés

(Con tubo de perforación de 4½", y para perforación proporcionalmente más profunda, con tubo de perforación de 3½".)

Puede Vd. seleccionar un aparejo de perforación Ideal para casi todo requisito de perforación por sistema rotativo con motores de explosión interna. Cada aparejo comprende un aparejo de maniobras o torno de extracción y grupo transmisor. Para facilitar el transporte, el aparejo de maniobras está dividido en dos mitades, que se juntan con pernos. Cada aparejo de perforación está provisto de un embrague principal de fricción o rozamiento, el cual, en combinación con los embragues de fricción en las transmisiones de alta velocidad, asegura adaptabilidad y funcionamiento expedito. Se da elección a seis velocidades de levantamiento y tres velocidades de movimiento de rotativa. La correcta lubricación está asegurada mediante un sistema mixto de alimentación mecánica y alimentación por gravedad.

IDEAL POWER PUMPS

There is a proper Power Pump selection for each of the above rigs, in accordance with horsepower and working pressure requirements.



BOMBAS MECANICAS IDEAL

Para cada tamaño de aparejo de perforación anotado arriba hay una bomba mecánica adecuada, que responde exactamente a los requisitos de fuerza mortríz y presiones de trabajo.

SIZE	H.P. INPUT	HYDRAULIC OUTPUT	WORKING PRESSURE	GROSS WEIGHT
D-50 5" x10"	59	50	1000 lbs.	6200 lbs.
C-100 6¼"x10"	118	100	1500 lbs.	12500 lbs.
C-150 6¼"x12"	177	150	2000 lbs.	17900 lbs.
C-250 7¼"x15"	294	250	2500 lbs.	31000 lbs.
C-350 7¾"x18"	412	350	3000 lbs.	39000 lbs.

TAMANO	C. de F.	RENDIMIENTO HIDRAULICO	PRESION DE TRABAJO	PESO BRUTO
D-50 5" x10"	50	50	1000 lbs.	6200 lbs.
C-100 6¼"x10"	118	100	1500 lbs.	12500 lbs.
C-150 6¼"x12"	177	150	2000 lbs.	17900 lbs.
C-250 7¼"x15"	294	250	2500 lbs.	31000 lbs.
C-350 7¾"x18"	412	350	3000 lbs.	39000 lbs.

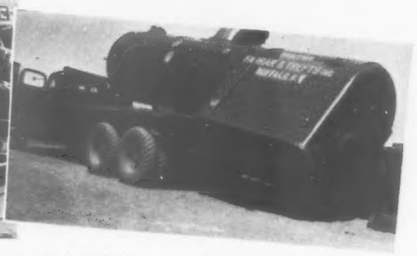
THE NATIONAL SUPPLY CORPORATION

30 ROCKEFELLER PLAZA, NEW YORK, N. Y., U. S. A. • FINSBURY CIRCUS & SOUTH PLACE, LONDON, E. C. 2

TULSA WINCHES FOR ALL TRUCK SIZES

Fleet of Trucks equipped with Tulsa Winches by Charles E. McEneary & Co., Ltd., San Fernando, Trinidad, B. W. I.

Brigada de camiones equipados con montacargas Tulsa por la Charles E. McEneary & Co., Ltd., de San Fernando, Trinidad, Antillas Inglesas.



Loading large oil field boiler on truck with a Tulsa Winch

Cargando un pesada caldera de campo de petróleo, en un camión, con la ayuda de un montacarga Tulsa.

½ TON TO 5 TONS OR LARGER

$115 to $1300

F.O.B. TULSA, OKLAHOMA, U.S.A.

Favorites in oil fields everywhere, because Tulsa Winches get the tough, heavy jobs done easier and quicker. Thoroughly dependable, they are proven in every way . . . more powerful . . . more economical to own and operate, and safer in handling any type of a load.

Investigate this big Winch VALUE . . . Its outstanding performance . . . its record of long trouble-free service . . . and its lower cost.

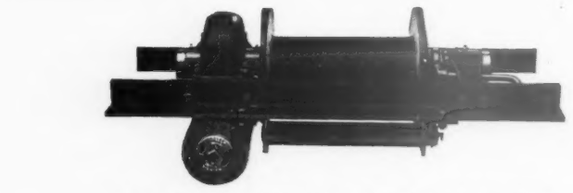
Write for descriptive Bulletin No. 7-40 showing complete line and prices.

Tulsa Winch distributors throughout the world.

Los montacargas Tulsa son los favoritos en todos los campos petrolíferos, a causa de ejecutan con mayor facilidad y rapidez los trabajos más difíciles y pesados. Su seguridad y utilidad práctica han sido confirmadas en todas partes . . . son más poderosos . . . más económicos en precio inicial y en gastos de explotación, y más seguros en el manejo de cualquier tipo de carga.

Sírvase informarse acerca de estos montacargas de gran valor intrinseco . . . Impóngase de su sobresaliente funcionamiento . . . su larga historia de servicios exentos de molestias . . . su costo más bajo.

Pídanos nuestro boletín descriptivo No. 7-40, en que mostramos y damos los precios de todos nuestros productos.

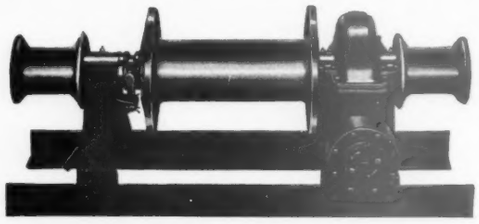


MODEL 18—1½ AND 2 TON TRUCKS

MODEL 18—For trucks where tank or body design prevents the line from working over the top of the truck bed. Safe working load, 12,000 lbs. Breaking point, approximately 45,000 lbs. Drum cable capacity . . . ½ in. 462 ft., 5/8 in. 330 ft., ¾ in. 314 ft. Weight 450 lbs.

MODELO 18—PARA CAMIONES DE 1½ y 2 TONELADAS

MODELO 18—Para camiones en que el depósito o forma de la caja no permite que el cable trabajo sobre la parte superior de la plataforma del vehiculo. Capacidad de carga segura de trabajo, 12,000 libras. Punto de ruptura, cerca de 45.000 libras. Capacidad de cable del tambor . . . 462 piés de cable de ½"; 330 piés de cable de 5/8"; 314 piés de cable de ¾". Peso, 450 libras.

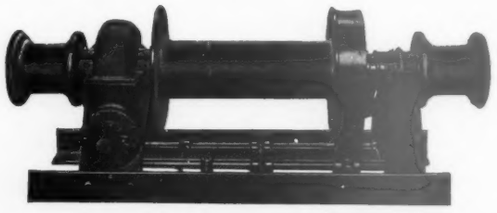


MODEL 19—1½ AND 2 TON TRUCKS

MODEL 19—Safe working load, 12,000 lbs. Breaking point, approximately 45,000 lbs. Drum cable capacity . . . ½ in. 462 ft., 5/8 in. 330 ft., ¾ in. 314 ft. Weight 575 lbs.

MODELO 19—PARA CAMIONES DE 1½ y 2 TONELADAS

MODELO 19—Capacidad de carga segura de trabajo, 12.000 libras. Punto de ruptura, cerca de 45.000 libras. Capacidad de cable del tambor . . . 462 piés de cable de ½"; 330 piés de cable de 5/8"; 314 piés de cable de ¾". Peso, 575 libras.



MODELS	*Model 21*	*Model 23*	*Model 28*	*Model 64*
For truck sizes	1½ & 2 ton	1½ & 2 ton	2 & 3 ton	3 & 4 ton
Safe working load	12,000 lbs.	15,000 lbs.	20,000 lbs.	35,000 lbs.
Breaking point approximately	45,000 lbs.	53,000 lbs.	65,000 lbs.	100,000 lbs.
Weight	650 lbs.	700 lbs.	800 lbs.	1,200 lbs.

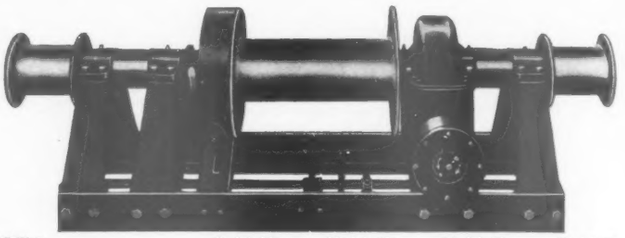
DRUM CABLE CAPACITY

Models 21 & 23	½ in. 649 ft., 5/8 in. 493 ft., ¾ in. 382 ft.
Model 28	5/8 in. 701 ft., ¾ in. 540 ft., ¾ in. 365 ft.
Model 64	¾ in. 726 ft., ¾ in. 510 ft., ⅞ in. 371 ft.

MODELOS	*Modelo 21*	*Modelo 23*	*Modelo 28*	*Modelo 64*
Para camiones de tamaños de	1½ y 2 ton.	1½ y 2 ton.	2 y 3 ton.	3 y 4 ton.
Carga segura de trabajo	12.000 lb.	15.000 lb.	20.000 lb.	35.000 lb.
Punto de ruptura, como a	45 000 lb.	53.000 lb.	65.000 lb.	100.000 lb.
Peso	650 lb.	700 lb.	800 lb.	1,200 lb.

CAPACIDAD DE CABLE DEL TAMBOR

Modelos 21 y 23	649 piés de ½"; 493 piés de 5/8"; 382 piés de ¾"
Modelo 28	701 piés de 5/8"; 540 piés de ¾"; 365 piés de ¾"
Modelo 64	726 piés de ¾"; 510 piés de ¾"; 371 piés de ⅞"



MODELS	*Model 30*	*Model 65*	*Model 70*	*Model 80*
For truck sizes	2 & 3 ton	3 & 4 ton	4 ton & larger	4 ton & larger
Safe working load	20,000 lbs.	35,000 lbs.	50,000 lbs.	65,000 lbs.
Breaking point approximately	65,000 lbs.	100,000 lbs.	150,000 lbs.	200,000 lbs.
Weight	1,000 lbs.	1,350 lbs.	1,550 lbs.	2,200 lbs.

DRUM CABLE CAPACITY

Model 30	5/8 in. 701 ft.; ¾ in. 540 ft., ¾ in. 365 ft.
Model 65	¾ in. 726 ft., ¾ in. 510 ft., ⅞ in. 371 ft.
Model 70	¾ in. 704 ft., ⅞ in. 519 ft., 1 in. 374 ft.
Model 80	¾ in. 909 ft., ⅞ in. 673 ft., 1 in. 505 ft.

MODELOS	*Modelo 30*	*Modelo 65*	*Modelo 70*	*Modelo 80*
Para camiones de tamaños de	2 y 3 ton.	3 y 4 ton.	4 y más ton.	4 y más ton.
Carga segura de trabajo	20.000 lb.	35.000 lb.	50.000 lb.	65.000 lb.
Punto de ruptura, como a	65.000 lb.	100.000 lb.	150.000 lb.	200.000 lb.
Peso	1.000 lb.	1.350 lb.	1.550 lb.	2.200 lb.

CAPACIDAD DE CABLE DEL TAMBOR

Modelo 30	701 piés de 5/8"; 540 piés de ¾"; 365 piés de ¾"
Modelo 65	726 piés de ¾"; 510 piés de ¾"; 371 piés de ⅞"
Modelo 70	704 piés de ¾"; 519 piés de ⅞"; 374 piés de 1"
Modelo 80	909 piés de ¾"; 673 piés de ⅞"; 505 piés de 1"

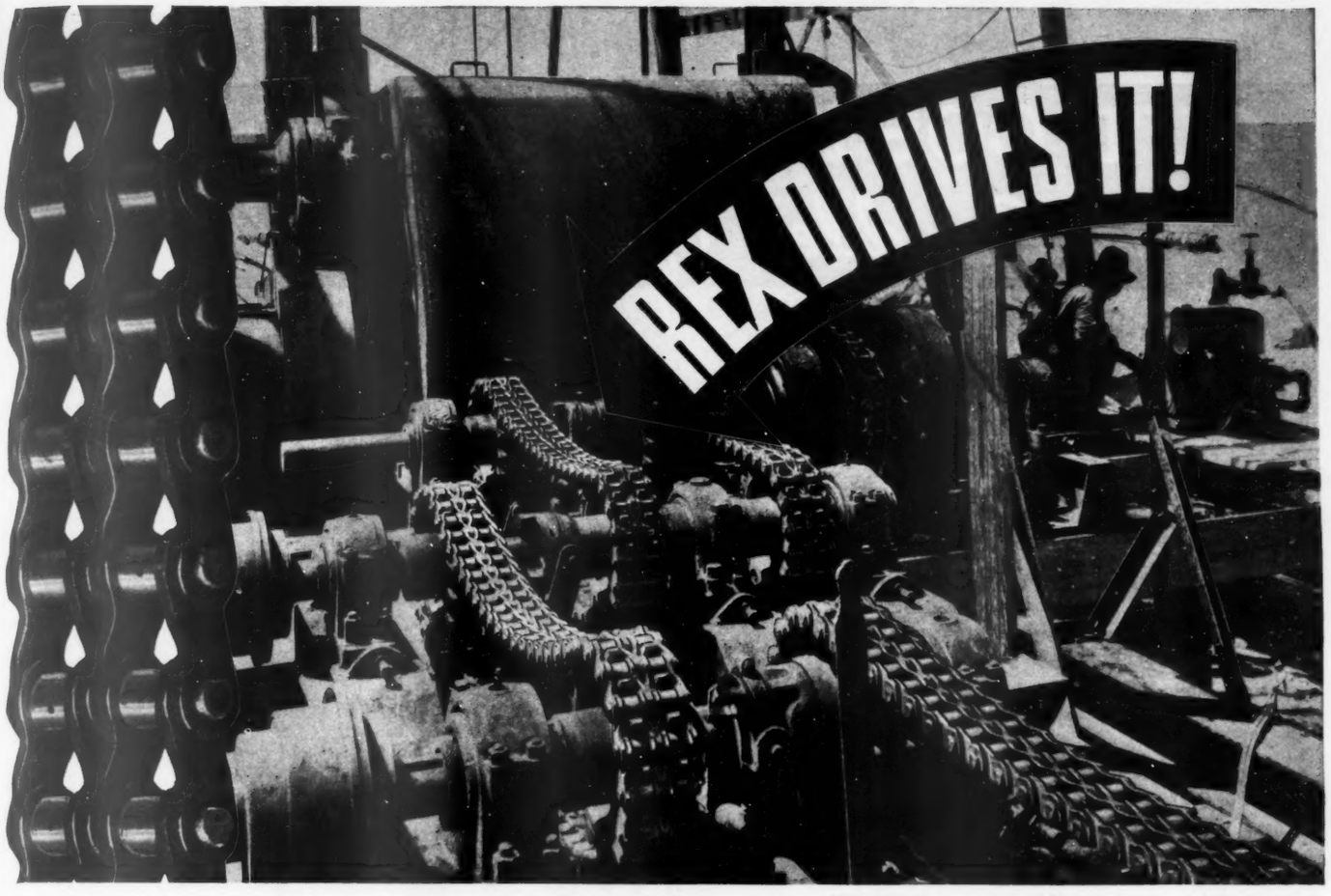
Tulsa Winches are known as ALL PURPOSE Winches. Used in oil fields, pipe line construction, utilities, and logging industry.

Los montacargas Tulsa son modelos de *servicio universal*. Se usan en campos petrolíferos, construcción de lineas de tubería, instalaciones de utilidades públicas y en la industria de la madera.

TULSA WINCH

MANUFACTURING COMPANY

713 East 1st St. TULSA, OKLAHOMA, U.S.A.



CONSISTENTLY

THE GREATEST CHAINS THAT EVER HIT THE OIL FIELDS!

Since the days when Rex Malleable Detachable was the standard chain on old-time rigs, Rex oil well chains have been cost-cutting factors in every oil-producing center.

Today, Rex Standard, Deepwell, Champion and Universal Chains form a quartette that meets every modern drilling requirement, in fields shallow or deep.

They represent the greatest combination of qualities for resisting wear and lengthening working life ever built into oil well chains. Matched "flats" in the side bars, positive pin locks and more effective lubricating methods are all features that make Rex Chabelco chains a sound choice for work on your drives, on your rigs. All over the world, *Chabelco's the choice in chains!*

An interesting description of the history of oil well chain development is contained in the Rex oil well chain data book. Send for your copy. Chain Belt Company, 1619 W. Bruce St., Milwaukee, Wisconsin.

Desde los tiempos en que la Rex Malleable Detachable era la cadena de norma de los aparejos de perforación de estilo antiguo, las cadenas Rex para pozos petrolíferos han sido factores de reducción de gastos en todos los centros productores de petróleo.

Hoy en día, las cadenas Rex Standard, Deepwell, Champion y Universal forman un cuarteto que responde a todo moderno requisito de perforación en formaciones petrolíferas a poca y gran profundidad.

Representan la mejor combinación de propiedades de resistencia al desgaste y seguridad de prolongada duración efectiva, que se haya visto hasta ahora en cadenas para pozos de petróleo. Las caras planas hermanadas de las barras laterales, los cierres positivos de los pasadores y los métodos más efectivos de lubricación, son ventajas que recomiendan las cadenas Rex Chabelco, como una acertada elección, para sus trabajos de transmisión en sus equipos de perforación. En todas partes del mundo, las Rex Chabelco son las cadenas más preferidas.

En el libro de datos de cadenas Rex para pozos de petróleo se incluye una interesante narración del desarrollo de la cadena de transmisón de pozo petrolífero. Pídanos un ejemplar de este libro. Chain Belt Company, 1619 W. Bruce St., Milwaukee, Wisc., E.U.A.

SOLD FROM STOCK BY

Mid-Continent and Gulf Coast Distributors:

Frick-Reid Supply Corporation; Rex Supply Company; Lucey Products Corporation; Industrial Supply Company, Inc.; Norvell-Wilder Supply Company; Bethlehem International Supply Company; Murray-Brooks Hardware Company, Ltd.; Coastal Supply Company; Dunigan Tool and Supply Company.

Distributed in California by Leading Supply Houses

REX CHAIN

CHAIN BELT COMPANY OF MILWAUKEE

CUT COSTS TODAY with "The Spudder of Tomorrow"

36-L

The new Bucyrus-Erie 36-L has the ability to handle drilling tools equal to 1/5 the total weight of the complete machine; handles over 4,500 lbs. of tools in shallow holes or combined weight of 6,000 lbs. to 7,000 lbs. of tools and cable in deeper holes.

Trailer mounting for haulage at truck speeds permits moving over any highway. Base of machine frame is flush and smooth on bottom to allow entire unit to be loaded on oil country truck, landed on floor of standard derrick or mounted on mud boat. Derrick and braces, which are compactly folded on top of frame when moving can be completely set up in 20 minutes.

Investigate the possibility of cutting your costs with this new Big 36-L. Write for bulletin today.

AHORRE LOS COSTOS DE HOY DIA and *"La Perforadora Inicial de Mañana"*

El nuevo modelo Bucyrus-Erie 36-L tiene la facultad para manejar herramientas de perforación que equivalen a 1/5 del peso total de la máquina completa; maneja más de 4500 libras de herramientas en agujeos de poca profundidad o un peso combinado de 6000 a 7000 libras de herramientas y cable en agujeros más profundos.

Su instalación en remolque para el transporte a las velocidades de un camión facilita su movimiento por los caminos. La base del bastidor de la máquina queda plana y suave sobre el fondo, para facilitar la colocación de todo el grupo sobre el camión, sobre el piso de una torre normal o sobre un bote de pantano. La torre y los refuerzos se doblan o pliegan encima del bastidor, para su transporte, y pueden montarse en 20 minutos.

Estudie las posibilidades de reducir sus gastos con esta nueva perforadora inicial 36-L. Pídanos boletín ahora mismo.

BUCYRUS ERIE

Look over the 24-L. This smaller companion machine swings up to 2,500 lbs. of tools, has ample capacity to drill and swab to 2,000 ft. This smaller spudder is also of all steel welded construction in a welded trussed box frame. Derrick is 40 foot telescoping. Gasoline Diesel engine or electric power are available. Ask for the bulletin on the 24-L, too. It gives complete information on this popular all modern spudder.

Estudie el modelo 24-L. Este modelo compañero más pequeño maneja hasta 2500 libras de herramientas, y tiene amplia capacidad para perforar y limpiar hasta 2000 piés. Esta perforadora inicial más pequeña es toda de construcción de acero soldado, con bastidor reforzado y soldado. La torre de extensión tiene 40 piés. Se ofrece con motor de gasolina o Diésel o con motor eléctrico. Pídanos nuestro boletín sobre el modelo 24-L. Da completa información sobre esta moderna y popular perforadora inicial.

BUCYRUS-ERIE COMPANY

SOUTH MILWAUKEE • WISCONSIN • U.S.A.

Acuda a la Universal
Come to Universal

La gasolina es la energía vital del transporte comercial — el alma de la defensa de la Nación.

La seguridad nacional depende actualmente de la abundante provisión de gasolina de primera clase, así como de iso-octano y otros productos del petróleo, de superior y especial calidad.

La Universal puede proporcionarle ahora los medios para la debida elaboración de estos productos.

Entre estos procedimientos figuran los siguientes:

Cracking Dubbs
"Reformación" pirolítica
Cracking catalítico
"Reformación" catalítica
Polimerización
Alquilación
Isomerización
Ciclización
Aromatización
Hidrogenación
Deshidrogenación

Lo invitamos a escribirnos en solicitud de informes completos.

Gasoline is the life energy of commercial transportation; the lifeblood of national defense

Today national security depends on plentiful supplies of super-quality gasoline including Iso-octane and other petroleum products of special high quality

Universal can supply you with the means to make them now —

These processes include:

Dubbscracking
Pyrolytic reforming
Catalytic cracking
Catalytic reforming
Polymerization
Alkylation
Isomerization
Cyclization
Aromatization
Hydrogenation
Dehydrogenation

We invite you to write us for full information

Universal Oil Products Co
Chicago, Illinois

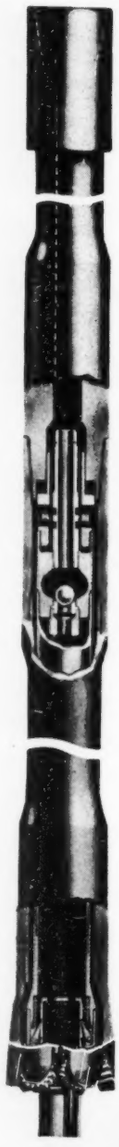
Dubbs Cracking Process
Owner and Licensor

COMPLETE CORING SERVICE

COMPLETO SERVICIO DE SACAR NUCLEOS

FOR
INCREASED CORE RECOVERY
AND
LOWER COST
PER CORE
RECOVERED

PARA
MAYOR RECUPERACION
DE NUCLEOS
Y MENOR COSTO DE
NUCLEO
RECUPERADO



CUTAWAY VIEW OF REED KOR KING CORE DRILL

The Reed Kor-King (Conventional type) Core Drill is of extremely simplified construction. The inner barrel is of the non-rotating or floating type and permits the core to enter without being broken apart or destroyed.

The core catchers are also non-rotating, of unified construction and plated against rusting.

Hard and soft formation cutter heads are inter-changeable on the same barrel and are manufactured to the usual rigid Reed specifications.

La sacanúcleos Reed Kor-King (de tipo corriente) es de construcción extremadamente simplificada. El cilindro interior es de tipo no giratorio o flotante, que permite la entrada del núcleo sin que se parta o destruya.

Los pescanúcleos son también del tipo no giratorio, de construcción unificada y enchapados para su protección contra el enmohecimiento.

Las cabezas perforadoras para formaciones duras y blandas son intercambiables en el mismo cilindro y se fabrican de acuerdo con las exigentes características de todo producto Reed.

The Reed B-R Wire Line Core Drill is especially designed for intermittent or continuous coring and eliminates many round trips of the drill pipe.

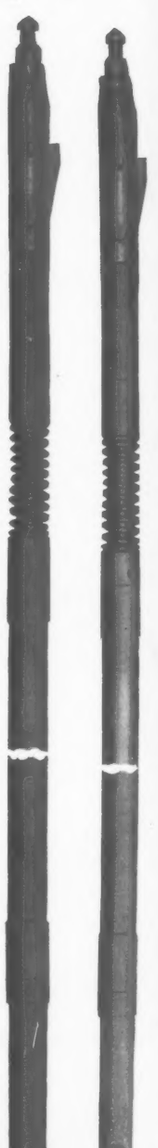
A few exclusive features of the Reed B-R are:

- Positive locking and releasing device for both core barrel and center bit assemblies.
- Spring loading regulates protrusion of cutter heads.
- Five size ranges allow operation in practically any size or type drilling rig.
- Replaceable core barrel cutter heads.

La sacanúcleos Reed B-R accionada por cable de alambre ha sido especialmente proyectada para trabajo contínuo o intermitente de sacar núcleos, y elimina muchos viajes de bajada y subida del tubo de perforación.

Entre los rasgos exclusivos de la Reed B-R citamos los siguientes:

- Dispositivo de cierre y soltura de acción positivia para el cilindro o sonda sacanúcleos y grupo de barrenas centrales.
- Tensión de resorte para regular la proyección de las cabezas perforadoras.
- Cinco escalas de tamaños permiten su operación en casi todo tamaño o tipo de aparejo de perforación.
- Cabezas perforadoras de sonda sacanúcleos renovables.



CORE BARREL ASSEMBLY

CENTER BIT ASSEMBLY

1. Franks skid-type portable rotary drilling rig in drilling position. 2. Franks truck-mounted portable rotary drilling rig. 3. Franks truck-type in over-the-road position. 4. Franks skid-type in position for hoisting the derrick.

1. Aparejo de perforación Franks, tipo rotativo portátil en patín, en posición de perforación. 2. Aparejo de perforación, tipo rotativo portátil, installado en camión. 3. Aparejo de perforación Franks, tipo de camión, en posición de marcha por camino. 4. Aparejo de perforación Franks, tipo de patín, en posición de levantamiento de torre.

PORTABLE ROTARY RIGS AND DERRICKS

Franks portable rotary drilling rigs, (truck-mounted on wheels, skid-mounted, or trailer-mounted with crawlers) effect savings in: unit cost; rig-up; tear-down; moving; labor; and fuel.

The thirteen models offered for deep "Slim-Hole", standard medium depth, and exploratory drilling, range in depth capacities from the shallowest to 8,500 feet. The design of these rigs embodies a drilling unit with drawworks, pumps, power plant, and derrick unitized for greatest portability, compactness, light weight, and flexibility. Block and lines may remain strung for moving.

Derrick units, with drawworks only, are also available in truck and skid-types for servicing.

The units are field tested, being in use in Mid-Continent, Gulf Coast, West Coast, Illinois Basin and Rocky Mountain domestic fields and in Peru, Venezuela, Colombia, Greece, Russia, Rumania, and Japan.

See the Composite Catalog for details or write Franks Mfg. Corp., Tulsa, Okla., U.S.A.

APAREJOS Y TORRES DE PERFORACION PORTATILES

Los aparejos de perforación Franks, tipo rotativo portátil (montados en ruedas, patines o en remolque con carriles) efectúan economías en costo de unidad, instalación, desintalación, mudanza, trabajo y combustible.

Los trece modelos ofrecidos para perforación de "agujero delgado," de profundidad mediana normal y perforación de exploración, varían en escala de capacidad de los agujeros más bajos a los de 8.500 piés de profundidad. La construcción de estos aparejos comprende un grupo de perforación con torno de extracción, bombas, motor y torre, todo unificado para facilitar su transporte, formando un grupo compacto, liviano en peso y muy adaptable. El bloque y los cables pueden quedar puestos, para la mudanza.

Los grupos de torre, con torno de extracción solamente, se ofrecen en tipos de camión y de patín, para trabajo de servicio.

Los grupos principales han comprobado su utilidad en servicio práctico en campos petrolíferos de la región central, región del golfo, región de la costa del Pacífico, cuencs de Illinois y Montañas Rocosas en los Estados Unidos de América, lo mismo que en campos en el Perú, Venezuela, Colombia, Grecia, Rusia, Rumia y Japón.

Vea el Catálogo Compuesto, para información detallada, o escriba a la Franks Mfg. Corp., Tulsa, Okla., E.U.A.

FRANKS REPRESENTATIVES

Export Office: A. V. Simonson, 149 Broadway, New York, U.S.A.

Michigan and Illinois Basin: Glen L. Wigton, Box 26, Vincennes, Indiana. *Texas, Gulf Coast, Arkansas and New Mexico:* R. M. White, 804 Neil P. Anderson Bldg., Ft. Worth, Texas. *Oklahoma, Kansas, Rocky Mountains:* W. R. Brown, Box 137, Whittier Sta., Tulsa, Oklahoma. *California:* Hillman-Kelley, Inc., 2441 Hunter St., Los Angeles, Calif.

FRANKS MFG. CORP.
WELL SERVICING AND DRILLING UNITS

TULSA, OKLAHOMA, U. S. A.

Cable Address: FRANSI

FRANKS PIONEERED
"Slim-Hole" drilling, portable rotary rigs, and servicing derricks.

Franks Recently Received the Largest Individual Foreign Order Ever Placed for Rotary Rigs.

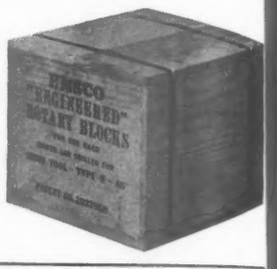
Rotary brake lining specialist A. F. McQuiston, of Bakersfield, California, has served on the toughest drilling jobs in this famous oil center for many years. His recommendation of Emsco Engineered Rotary Brake Linings, plus the fact that they have been used by the Kettleman North Dome Association for years, is proof that Emsco Linings are made to "take it" under the most extreme conditions.

"SUBJECTED TO *EXTREME SERVICE* YET NOTHING BUT THE *BEST RESULTS*"

AGAIN THAT'S THE RECORD OF EMSCO Engineered Rotary Lining

Wherever and whenever there's a TOUGH drilling job you find EMSCO ENGINEERED doing it better, more efficiently, more safely, more economically. Emsco isn't just another rotary lining. It is a patented application of a common sense braking principle, and heralded, and proved, an important contribution to drilling. IF YOU HAVE A TOUGH JOB INSIST UPON EMSCO.

Woven Plus Moulded — Emsco Engineered Rotary Brake Lining. The scientific combination of the correct type of lining at the right place on the drum is a patented Emsco feature.



EMSCO *Engineered Rotary Brake Lining*

EMSCO ASBESTOS COMPANY • DOWNEY, CALIFORNIA

Cable Address: EMBESTOS

OCECO TANK FITTINGS

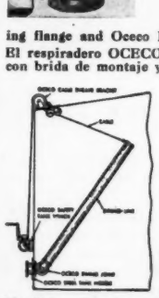
OCECO ACCESORIOS PARA TANQUES

The leading tank equipment all over the world—because it is the safest—Flame Arrestors, Vent Valves, Swing Line Fittings, Tank Gauges, Hatches, Manheads, Etc.

El principal equipo de tanque del mundo—a causa de que es el más seguro—Extinguidores de llamas, válvulas de respiraderos, conexiones de tubería oscilante, compuertas, etc.

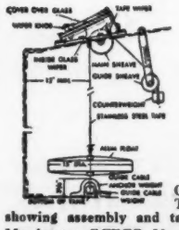
OCECO Type B Vent Unit complete with mounting flange and Oceco Flame Arrestor.

El respiradero OCECO, tipo B, completo, con brida de montaje y evitador de llama.



OCECO Swing Line showing the Tank Nozzle, Swing Joint, Cable Sheave Bracket, and Hand Winch.

Barra ocilante OCECO con boquerel de tanque, unión giratoria, roldana de cable y malacate manual.



OCECO No. 8 Tank Gauge showing assembly and tank mounting.

Manómetro OCECO No. 8 para tanque, incluyendo su montaje en el tanque.

Oceco Vents control tank breathing, minimize evaporation losses of gasoline and crude oil—and pay for themselves through savings. Oceco Flame Arrestors protect the tank and contents against fire. All interior working parts are of corrosion resistant aluminum construction and are fully enclosed within a semi-steel housing that protects them against direct exposure to heat and flames. Thousands of them already in use have a perfect service record.

NO GAS-TIGHT TANK EQUIPPED WITH AN OCECO FLAME ARRESTOR HAS EVER BEEN LOST BY FIRE.

Oceco Swing Lines permit tanks to be filled and emptied from any level. They prevent the possibility of leakage and "run-off"—and permit the making of repairs and replacements in feed lines, etc., while the tank is in use. The equipment consists of a steel nozzle, a heavy duty swing joint that will not twist or leak, a gas-tight stuffing box, cable sheave, and winch that permit entire operation from the ground.

Oceco Tank Gauges permit the taking of accurate readings without relieving pressure in the tank, or exposing the gauger to fumes, and are fitted with a plate glass window and inside wiper to insure clear vision.

More complete details of these and other Oceco products sent on request.

Specify Oceco Fittings—
Your tanks deserve the best.

Los respiraderos Oceco gobiernan la respiración o exhalación de los tanques, disminuyen las pérdidas por evaporación de gasolina y petróleo crudo y resarcen su precio con las economías que producen. Los extinguidores de llamas Oceco protegen el tanque y su contenido contra incendios. Todas las piezas móviles interiores son de aluminio de gran resistencia a la corrosión y están completamente incluidas en una caja de semiacero que las protege contra exposición directa al calor y llamas. Los millares de ellos en uso diario están dando completa satisfacción.

NINGUN TANQUE HERMETICO AL GAS, EQUIPADO CON UN EXTINGUIDOR DE LLAMAS OCECO, SE HA PERDIDO TODAVIA A CAUSE DE INCENDIO

La tubería oscilante Oceco permite llenar y vaciar el tanque desde cualquier nivel. Suprime la posibilidad de escape o derrame y permite reparar y renovar las tuberías de alimentación, etc., mientras se usa el tanque. El equipo consta de una boquilla de acero, una unión giratoria de trabajo pesado, que no puede retorcerse o producir escape, un prensaestopa hermético al gas, una roldana de cable y un malacate manual, que facilita hacer todo el trabajo desde el suelo.

El manómetro de tanque Oceco permite obtener acusaciones exactas, sin moderar la presión en el tanque y sin exponer el instrumento a los gases. Está provisto de una ventanilla de vidrio y de un limpiador interior para asegurar vista bien clara.

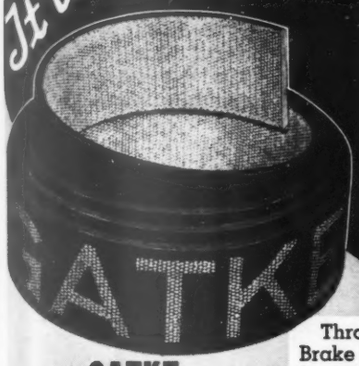
A solicitud suministraremos información detallada sobre los presentes y otros productos de marca Oceco.

Especifique los accesorios Oceco—
Sus tanques merecen lo mejor.

THE JOHNSTON & JENNINGS CO., *Oceco Division*

884 ADDISON ROAD • CLEVELAND, OHIO

It takes PERFORMANCE to HOLD FIRST PLACE



GATKE DEEP-WELL WOVEN

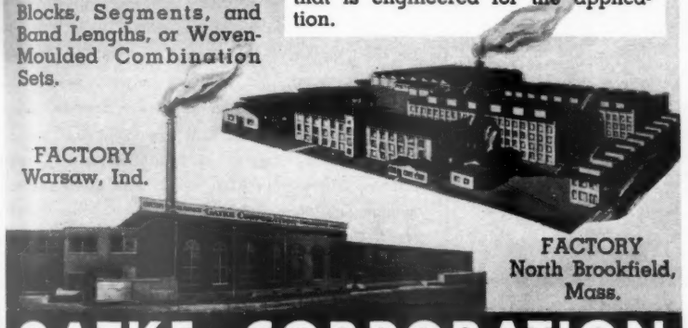
- Stands the heat and holds in deep well drilling and tough maintenance service.
- Feeds off with uniform ease from the top of the hole all the way down.
- Wears unbelievably long and prolongs flange life.
- Furnished in Die-Pressed Blocks, Segments, and Band Lengths, or Woven-Moulded Combination Sets.

Throughout the oil fields GATKE Brake Lining has come to mean *"The best that money can buy."*

Successful operators agree that standardization on GATKE Brake Lining is the way to get *real performance and lowest ton-mile costs.*

That's why GATKE Brake Lining is *predominantly* supplied by manufacturers of Drilling and Production Rigs as original equipment.

Avoid substitutes. Your Rig manufacturers have GATKE Brake Lining that is engineered for the application.



FACTORY
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FACTORY
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GATKE CORPORATION
228 N. La Salle St. Chicago, Ill.

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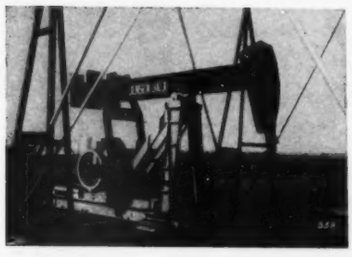
EXPORT: Lucey Export Corporation, 3505 Woolworth Bldg., New York City

JENSEN Pumping Units in South America



JENSEN JACKS are popular in areas where dependability is not only a good quality in a pumping unit, but an absolute necessity.

We are the oldest and largest manufacturer making pumping equipment only. We devote our unparalleled experience to keeping prices down and quality up.

Any South American producer not entirely satisfied with his present methods of lifting oil should communicate at once with our Export Office, 50 Church Street, New York City, U. S. A., for money-saving facts and figures.

IMPORTANT: We also make the world's most successful Rod Line Jacks for use with back side cranks and central pumping powers.

Grupos de bomba JENSEN en la América del Sur

LOS PRODUCTOS JENSEN son populares en todos los campos petrolíferos donde la seguridad es no sólo una buena propiedad del grupo de bomba, sino también una necesidad absoluta.

Somos los fabricantes más antiguos y grandes de equipo de bomba del mercado. Dedicamos nuestra sin igual experiencia a conservar bajos los precios y alta la calidad de nuestros productos.

Todo productor en la América Latina que no esté completamente satisfecho con sus presentes métodos de extracción de petróleo queda invitado a comunicarse en seguida con nuestro departamento de exportación en 50 Church Street, Nueva York, N. Y., E.U.A., pidiendo información detallada y precios.

IMPORTANTE: Fabricamos también el surtido más satisfactorio del mundo de gatos de cable de vástagos para uso con manivelas traseras y motobombas centrales.

JENSEN

J J BROTHERS MANUFACTURING CO.
Coffeyville, Kansas
EXPORT OFFICE: 50 Church St., New York

ENSIGN

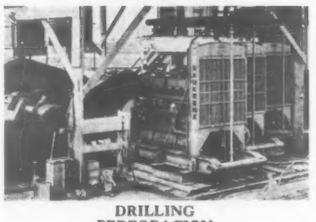
LEADS THE FIELD IN OIL INDUSTRY ENGINE CARBURETION

All standard engine manufacturers supplying the Western Hemisphere oil industry, use and recommend ENSIGN Carburetion Equipment for Natural Gas, Butane-Propane and Gasoline fuels. ENSIGN Butane-Propane Carburetion Equipment saves on fuel costs and has many other advantages for internal combustion engines used in transportation units; ENSIGN Natural Gas Carburetors or ENSIGN Combination Natural Gas and Gasoline Carburetors have proved their efficiency for pumping engines; ENSIGN Carburetion using one, two or all three of the above fuels is unsurpassed for drilling and servicing engines. Write to our main office, Huntington Park, California for further details. A competent engineering staff and twenty-nine years of carburetion experience are at your disposal.

Todos los fabricantes de motores de tipos normales que dan abastecimiento a la industria petrolífera del Hemisferio Occidental, usan y recomiendan el equipo de carburación ENSIGN para los combustibles de gas natural, butano-propano y gasolina. El equipo de carburación ENSIGN de butano-propano ahorra en gastos de combustible y tiene muchas otras ventajas para motores de explosión interna usados en vehículos de transporte. Los carburadores ENSIGN de gas natural y los carburadores ENSIGN de combinación de gas natural y gasolina, han demostrada su gran utilidad en máquinas de bomba. La carburación ENSIGN, que usa uno, dos o los tres combustibles anotados arriba, no tiene rival en los motores de perforación y servicio general. Escriba a la oficina principal en Huntington Park, Calif., E.U.A. pidiendo información completa. A su disposición tenemos un competente cuerpo de ingenieros y veintinueve años de experienca en la carburación.

TRANSPORTATION
TRANSPORTE

PUMPING
TRABAJO DE BOMBA


DRILLING
PERFORACION

SERVICING
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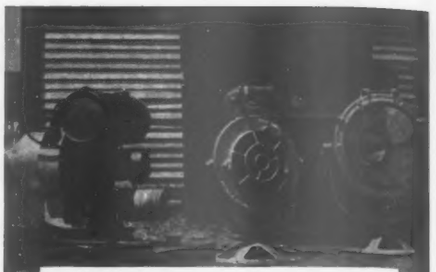

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have handy Electric Power with a
HOMELITE
Portable Generator

ON distant locations—far from any power supply—a Homelite Portable Generator gives you all the electricity you need for operating floodlights, electric tools, radios or geophysical and well surveying instruments. Small and compact—only 82 pounds complete with built-in gasoline engine—a Homelite is easily transported as part of your equipment. One man can take care of it—carry it—set it up and start it—*without trouble*. It generates 1800 watts. Has automatic close voltage regulation. Shield and filter available for radio work. Operates automatically—and economically. And is built to stand up under most severe operating conditions.

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Send for complete illustrated bulletins giving sizes, output and full information on all Homelite Portable Generators. These bulletins are available in both English and Spanish.

HOMELITE
CORPORATION
712 Riverdale Ave., Port Chester, New York

NOTICE

Drilling mud for foreign fields. 120 barrels good drilling mud per ton with our High Colloidal (Wyoming type) Bentonite.

Patent information, samples, also oil field analysis by W. C. Bednar, Associate Engineering Professor, Oklahoma University, furnished on request.

Write for prices f.o.b. Houston, Galveston, Mobile, New Orleans or Baltimore.

Perfection Clay Co., Inc.
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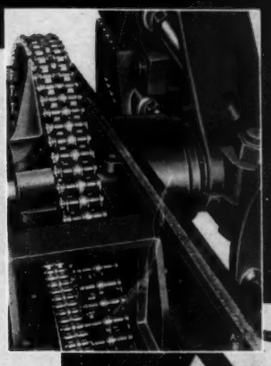
TULSA, OKLA., U. S. A.

ATLAS CHAIN REDUCERS

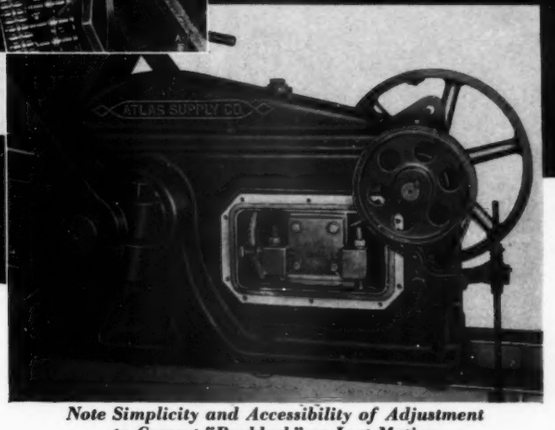
Also Reduce Wear, Tear and Repair

Note sturdy, compact construction of Atlas Chain Reducer (right)

Atlas Pumping Unit with Double Reduction Chain Reducer



- COMPACT DESIGN
- GREATER SHOCK ABSORBING CAPACITY
- LOAD DISTRIBUTED ON MANY TEETH
- ROLLING FRICTION
- ADJUSTABLE TO COMPENSATE WEAR
- MINIMUM REPAIR PARTS



Note Simplicity and Accessibility of Adjustment to Correct "Backlash" or Lost Motion

ATLAS PUMPING UNITS are heavy duty equipment, built for long life, trouble-free operation. Give maximum of service with minimum of attention.

More compact than others, Atlas Chain Reducers are adjustable to compensate for wear, backlash and lost motion. Chains have greater capacity to absorb shock loads. The load is distributed over a large number of teeth, thus reducing wear. Repairs, if necessary, are more economical; a single link can be replaced.

NOTE THESE FEATURES!

- Heavy Reducer Case, Rigidly Braced.
- Rugged Sprockets with Machine Cut Teeth.
- Extra-Heavy Roller Chains operating in oil, inside a Dust-Proof, Oil-Tight Housing.
- Timken Roller Bearings on all three shafts with flood lubrication.
- Intermediate Shaft and Bearings mounted in one piece frame, which sets into machined surfaces inside the case, providing a simple, positive, and accurate adjustment. An exclusive ATLAS feature.

BRIEF SPECIFICATIONS

Unit No.	401	708	808	1002	1402
Beam Rating	4000 lb.	7416 lb.	7416 lb.	10222 lb.	14250 lb.
HP Rating	6.00	6.00	9.6	11.25	23.45
Peak Torque	30000	30000	47768	55724	116087
Reduction Ratio	20:1	20:1	20:1	30:1	29:1
Maximum Stroke	24"	32"	32"	44"	54"

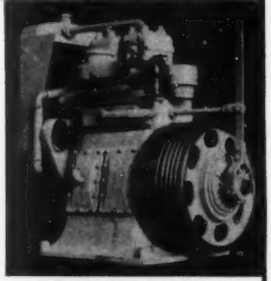
WEBER TYPE "H" GAS ENGINE FOR LOWER PUMPING COSTS

Heavy Duty 1 and 2 Cylinder Medium Speed 10-20 H. P.

A Heavy Duty engine specially designed for oil field service. Dependable, Low Cost, Uninterrupted Operation. Weber has built into this engine the character of design, sturdiness of construction and other features which have characterized Weber engines since 1884.

FEATURES

- Easy Starting.
- Heavy Duty Clutch.
- Radiator Cooling System.
- No Engine House Required.
- Sets on Any Pumping Unit—No Special Base Required.
- No Special Pulleys — Standard Bolt Rim Sheaves Used.
- Operates on Gas, Gasoline or Butane.



Weber 2 Cycle Type "H" Engine 2 Cylinder, 20 H. P.

Trinidad Agent: J. N. Harriman & Co., Ltd., Cross Crossing, San Fernando, Trinidad, B. W. I.

ATLAS SUPPLY CO.

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Branches in principal oil fields

Subsidiary of
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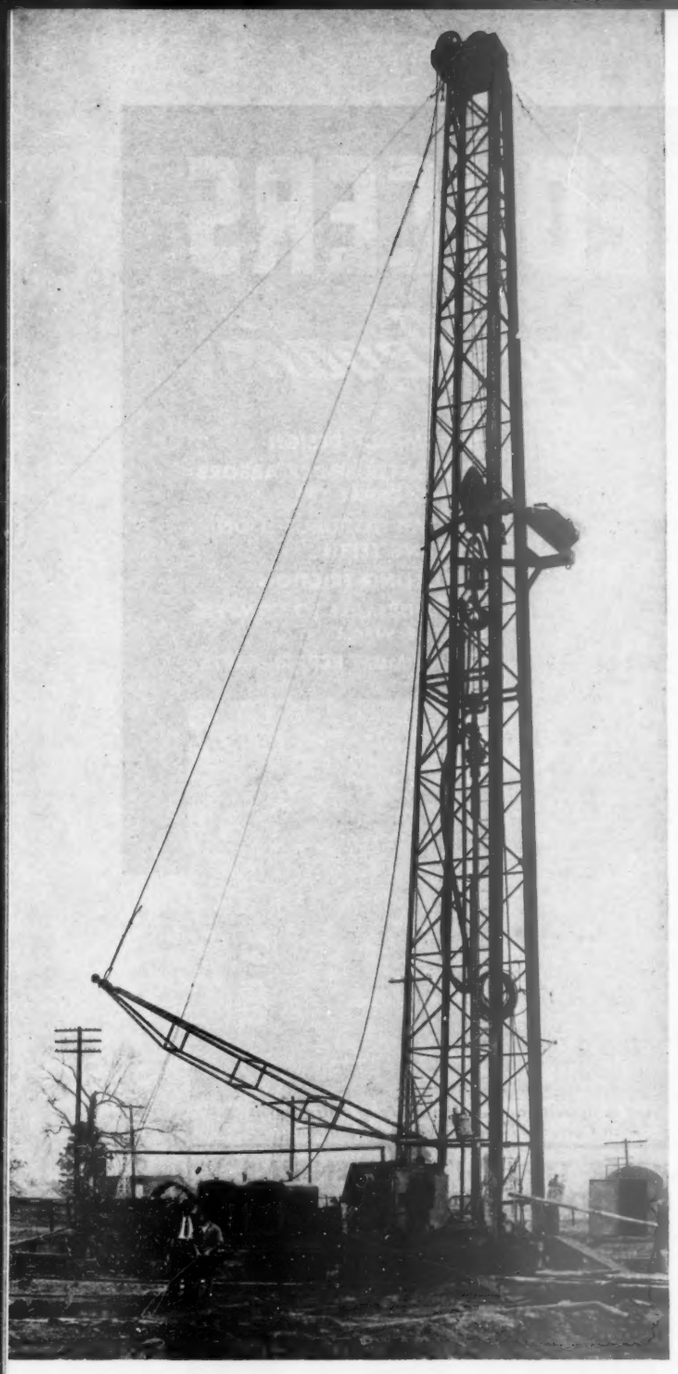


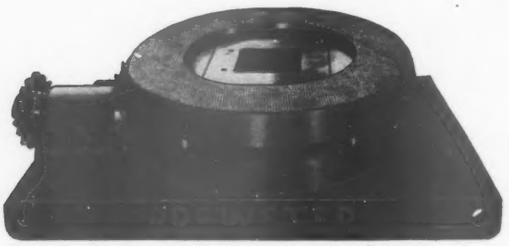
FOR SLIM HOLE DRILLING

This CR Type Rig designed by Brewster is equipped with a derrick type mast that enables drilling operations to be started only 6 hours after equipment has arrived on location. 4-speed oilbath transmission. Two sizes recommended for 3000′ and 5000′ drilling. Write for complete details on this Brewster rig.

FOR DRILLING FROM 3,000′ TO 10,000′

This popular rig is our VO Type and is available in 5 sizes. Single or compounded motors driven through 4-speed oilbath transmission. Before starting your next drilling program you should get the details and possibilities of this Brewster Rig.

Profit by BREWSTER'S 30 Years Experience Manufacturing Fine Drilling Equipment!



OILBATH ROTARIES

3 sizes with 18″, 22″ and 26″ full table opening. A.P.I. centerlines. Separate oil reservoirs for gears and table bearings. All gears machine cut and heat treated. Steel table bed and skid type base cast integral.

OILBATH SWIVELS

These slush-proof swivels are available in 100, 150 and 200 ton capacities. Oilbath lubrication for all bearings. Heavy forged bail. All steel.

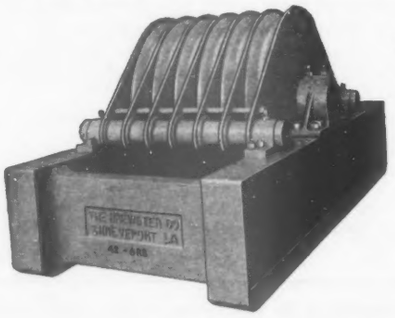
BREWSTER ROLLER BEARING BLOCKS

CROWN BLOCKS

Capacities:
125, 250 and 350 tons
4 to 6 sheaves.

TRAVELING BLOCKS

Capacities:
125, 250 and 350 tons
3 to 5 sheaves.



The BREWSTER CO. Inc.

Phone 2-3181 — **Shreveport, La.**

Branch Stores at New Iberia, La., and Houma, La.

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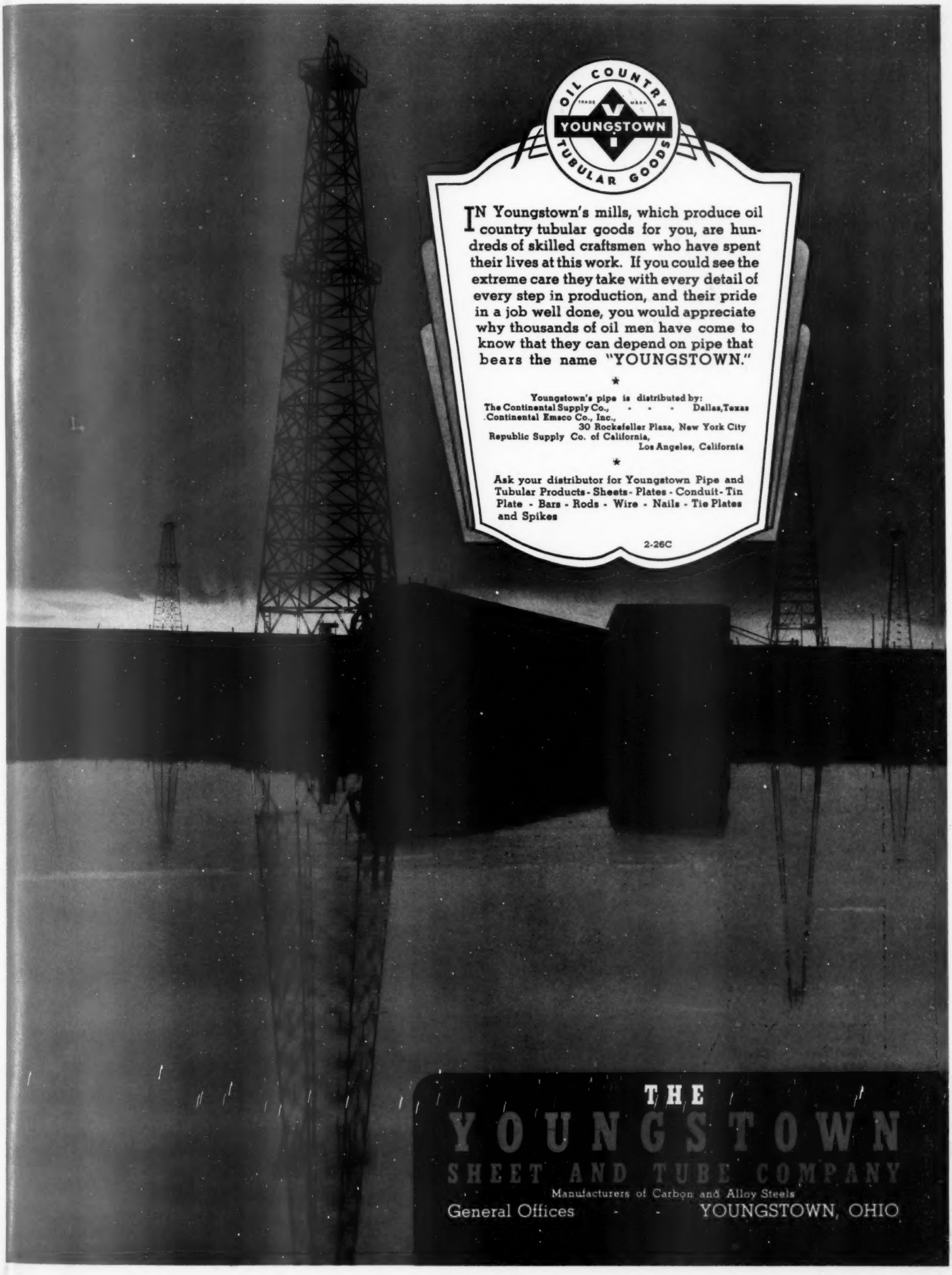

IN Youngstown's mills, which produce oil country tubular goods for you, are hundreds of skilled craftsmen who have spent their lives at this work. If you could see the extreme care they take with every detail of every step in production, and their pride in a job well done, you would appreciate why thousands of oil men have come to know that they can depend on pipe that bears the name "YOUNGSTOWN."

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Youngstown's pipe is distributed by:
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Republic Supply Co. of California,
Los Angeles, California

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Ask your distributor for Youngstown Pipe and Tubular Products - Sheets - Plates - Conduit - Tin Plate - Bars - Rods - Wire - Nails - Tie Plates and Spikes

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THE
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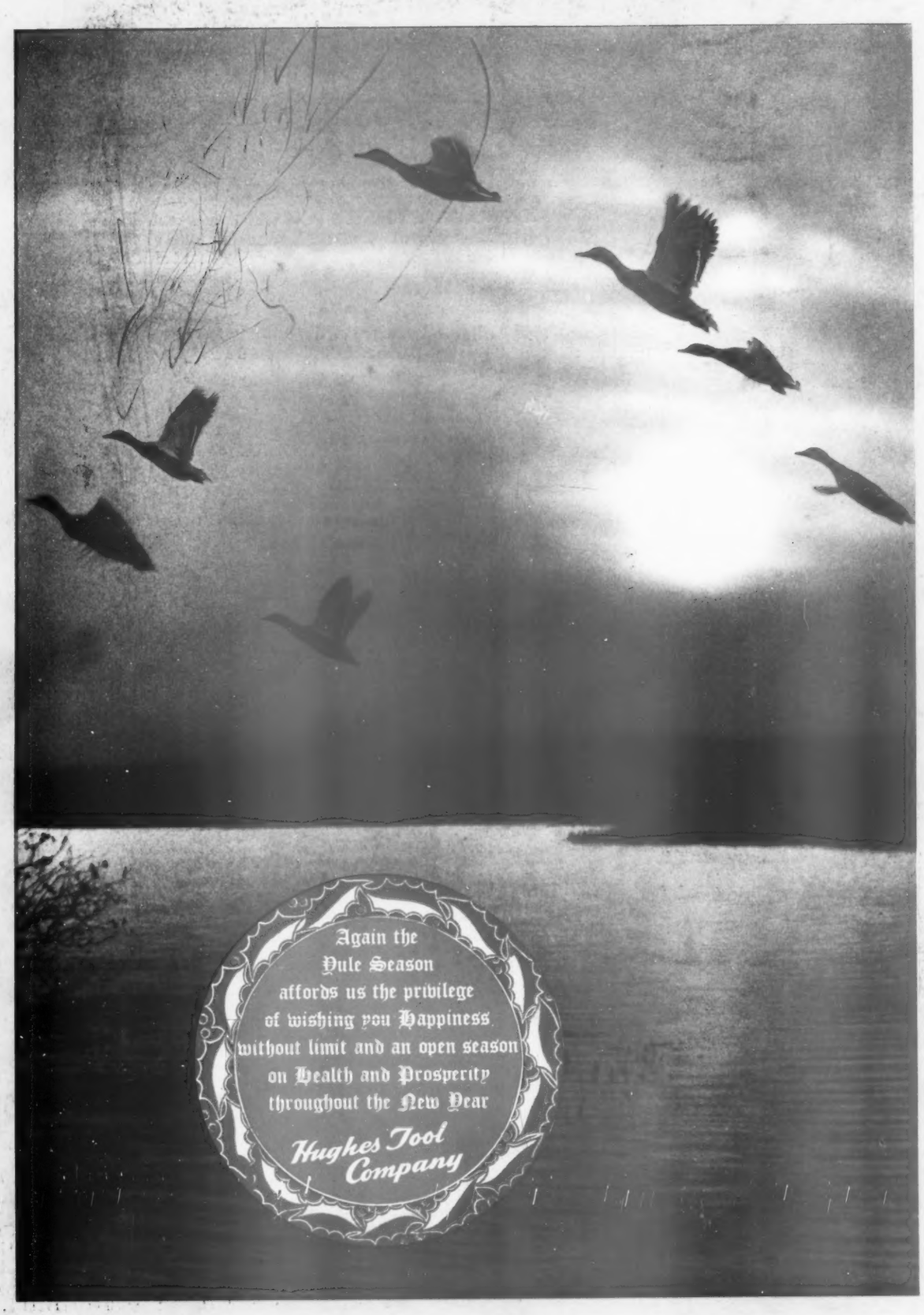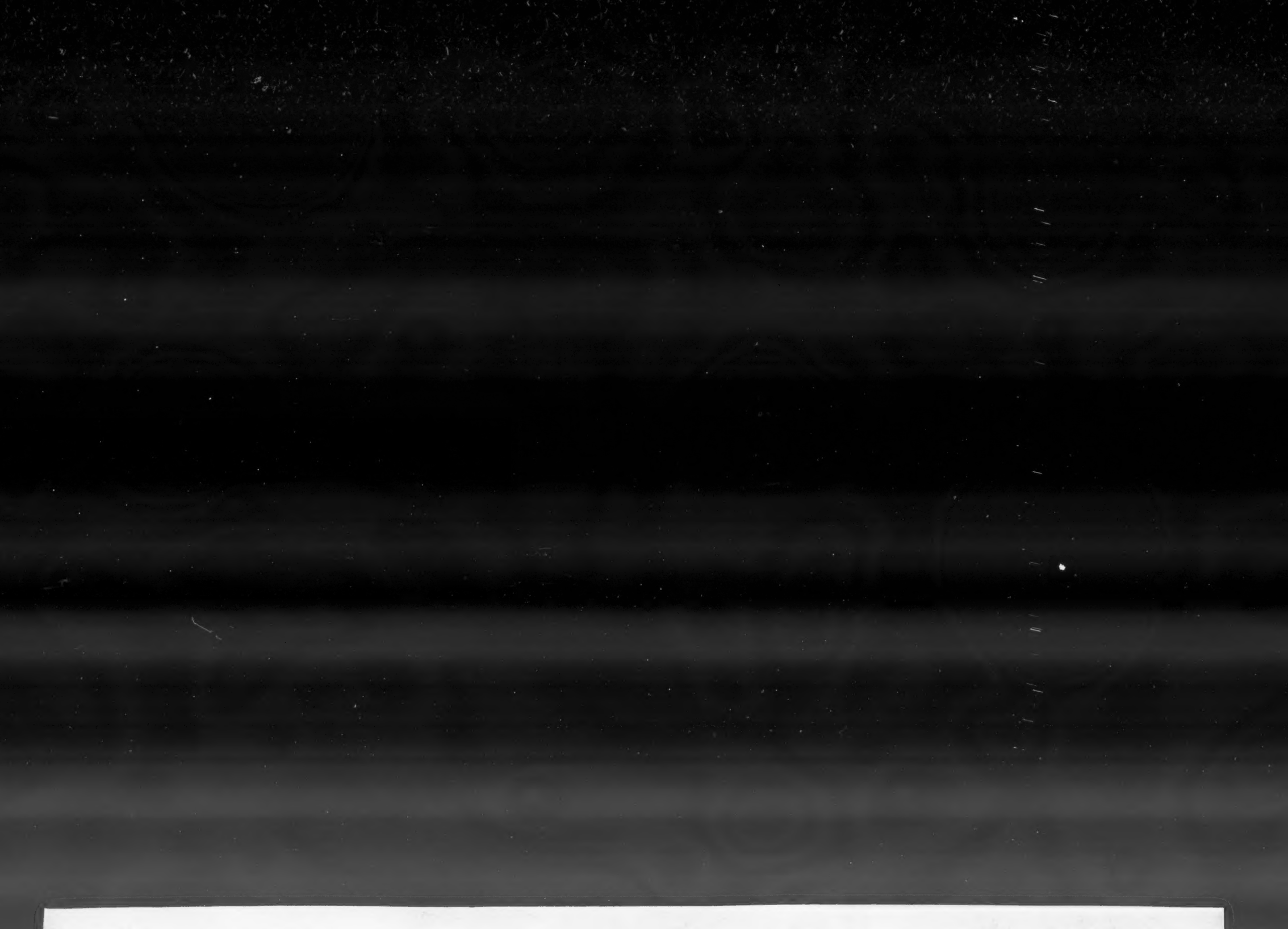
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Yule Season
affords us the privilege
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without limit and an open season
on Health and Prosperity
throughout the New Year
Hughes Tool
Company